FIG. 1

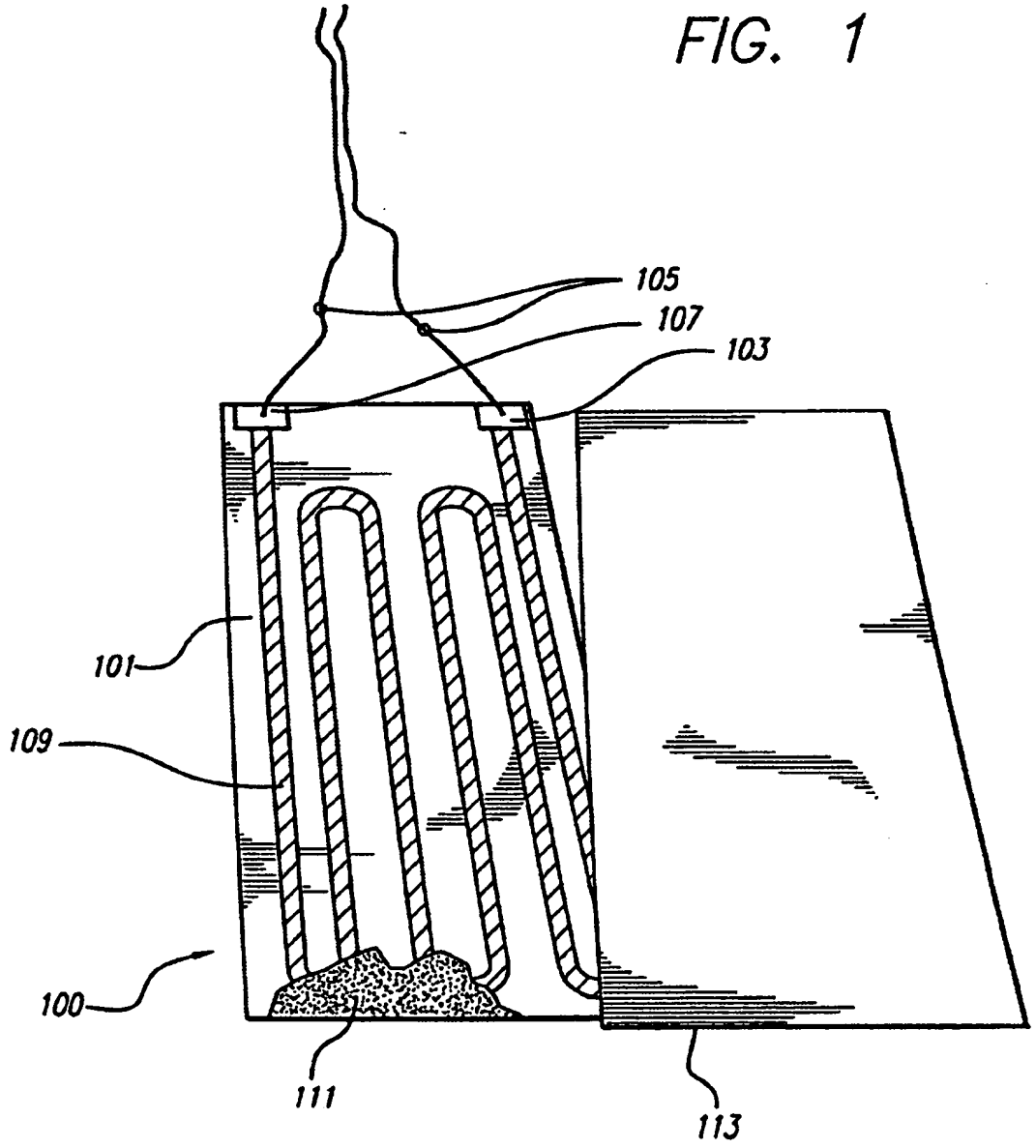


FIG. 2

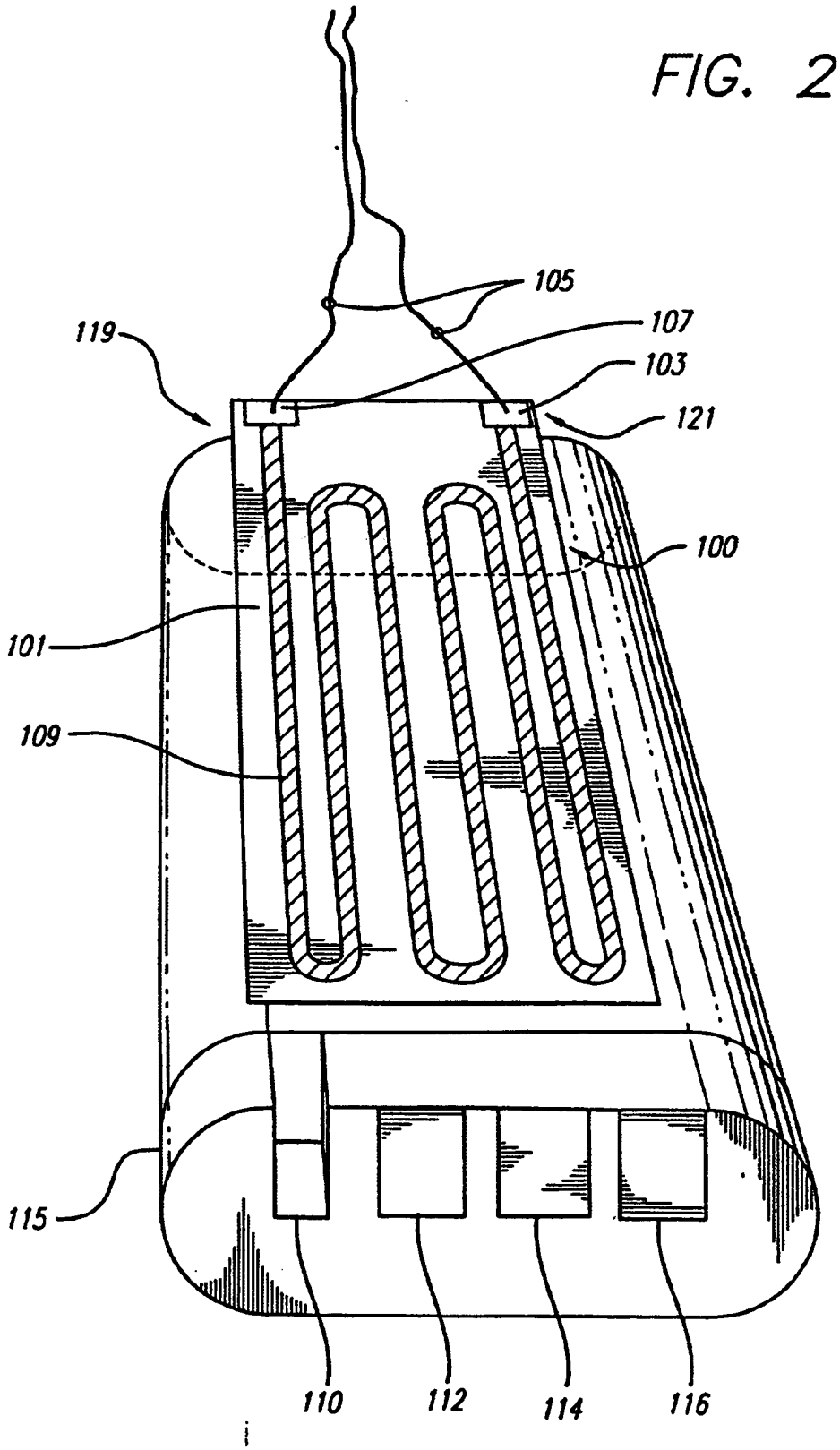


FIG. 3

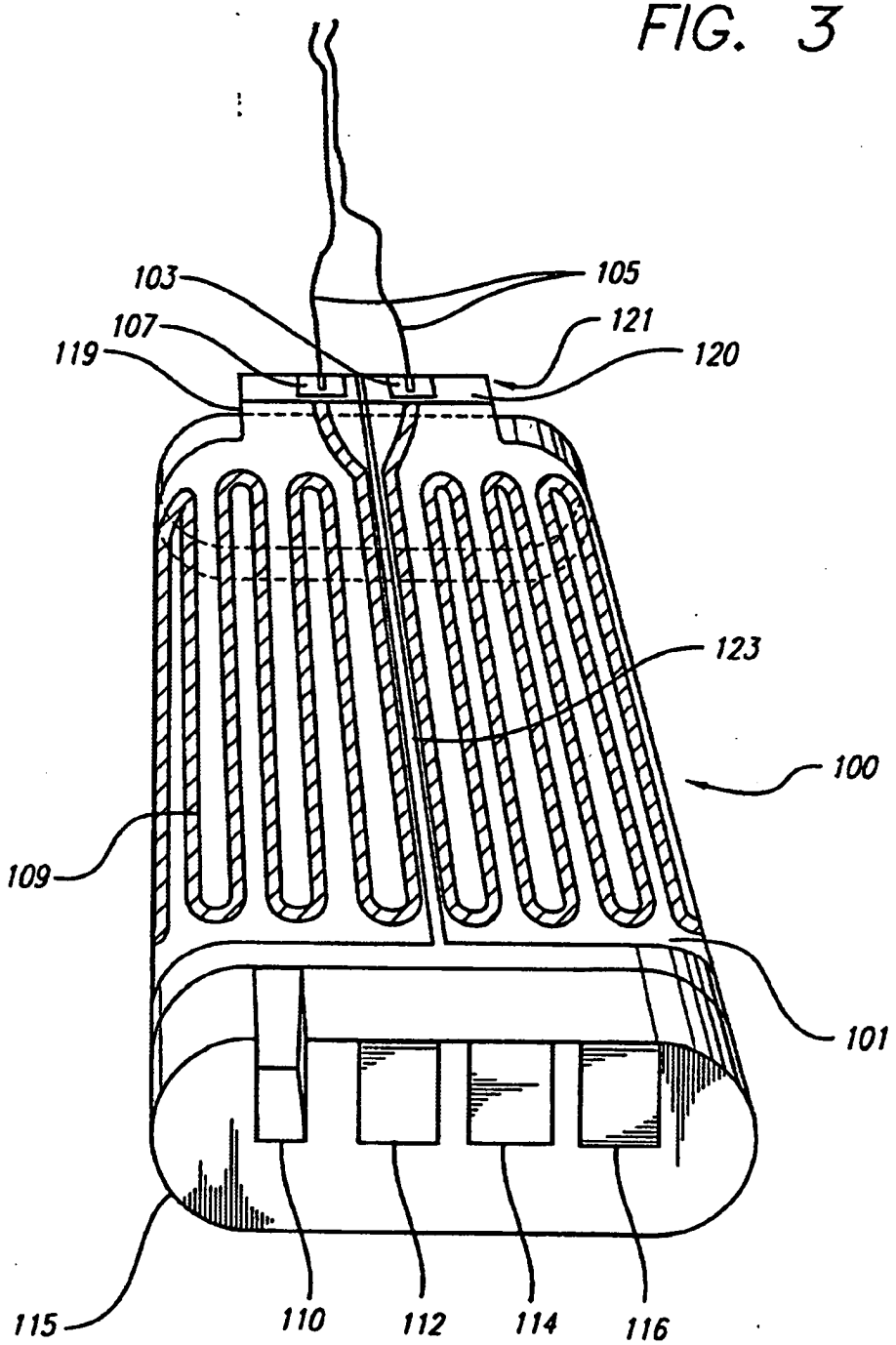


FIG. 4

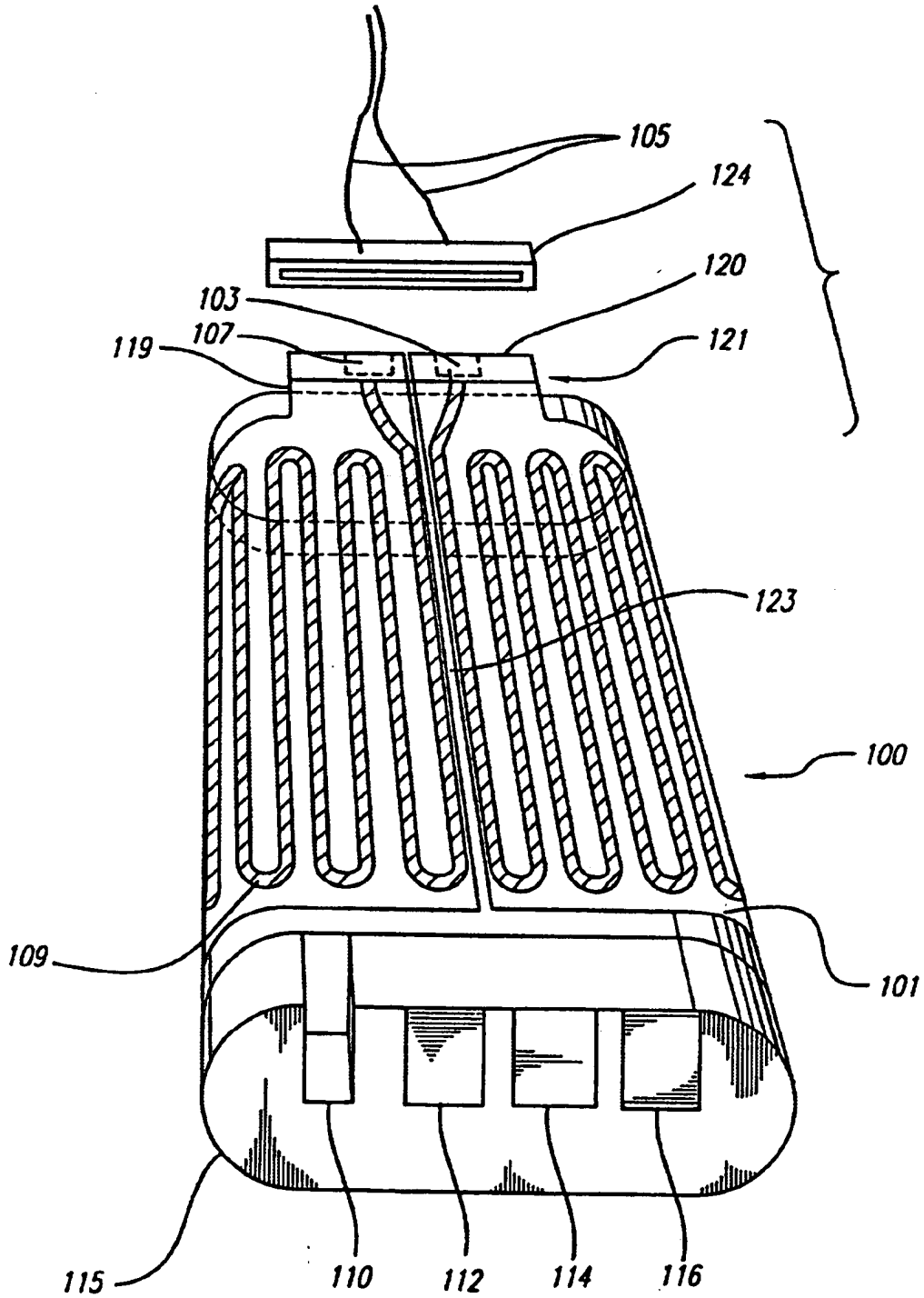
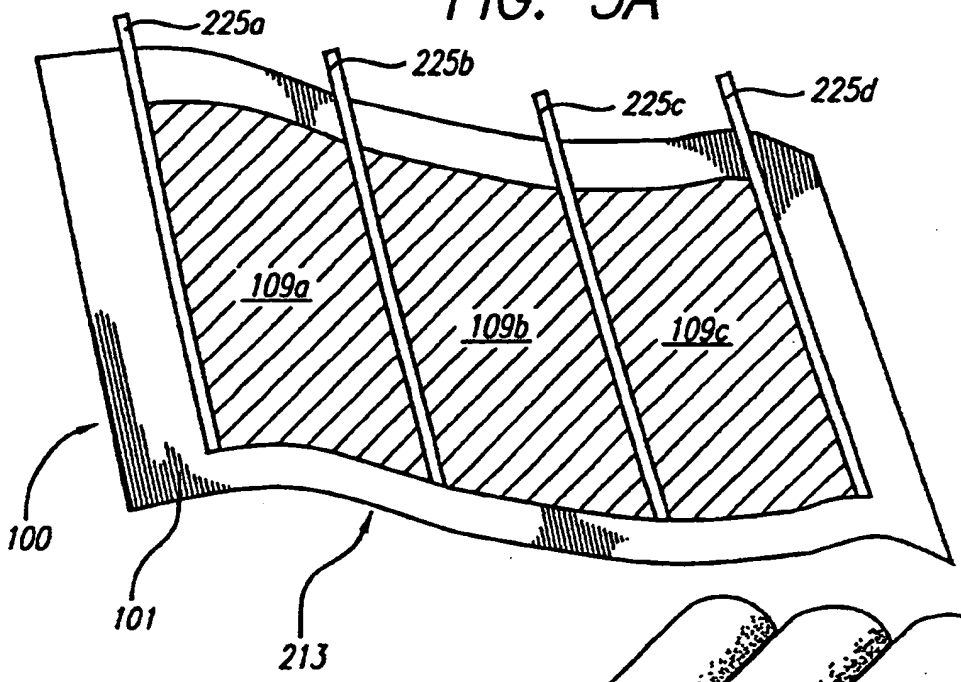


FIG. 5A


225a
225b
225c
225d
109a
109b
109c
100
101
213

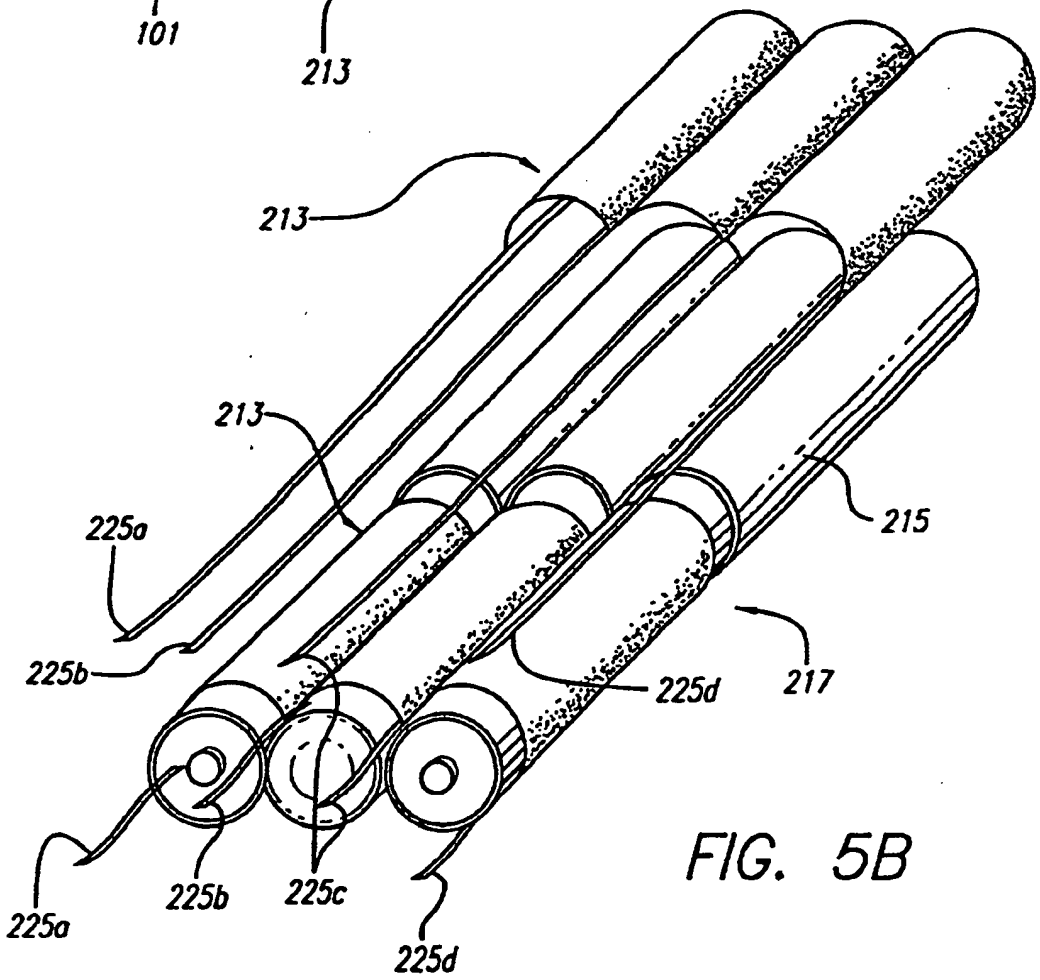

213
213
225a
225b
215
225d
217
225a
225b
225c
225d

FIG. 5B

FIG. 6

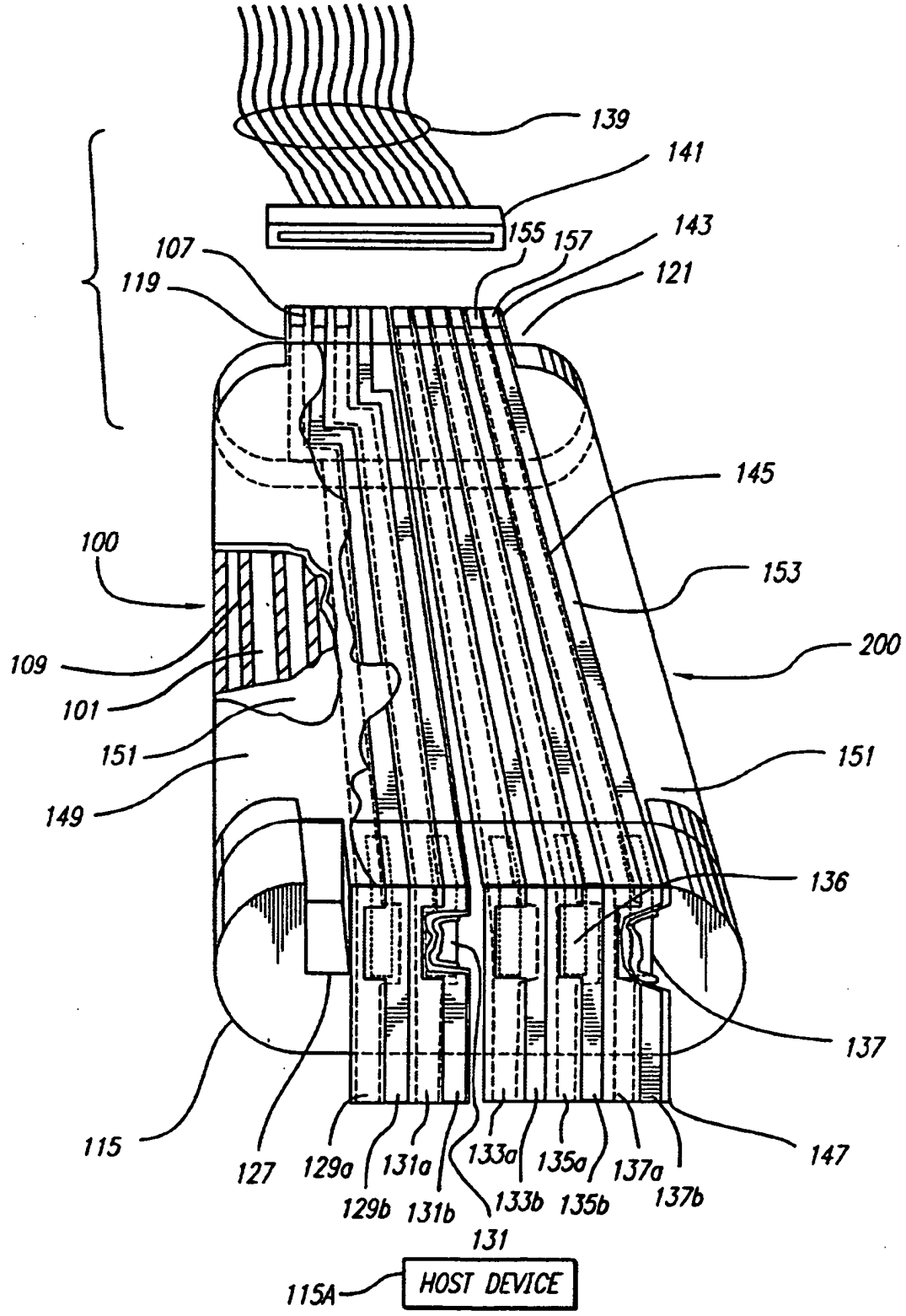

139
141
155
157
143
121
107
119
145
100
153
200
109
101
151
149
151
136
137
115
127
129a
131a
133a
135a
137a
147
129b
131b
133b
135b
137b
131
115A
HOST DEVICE

FIG. 7A

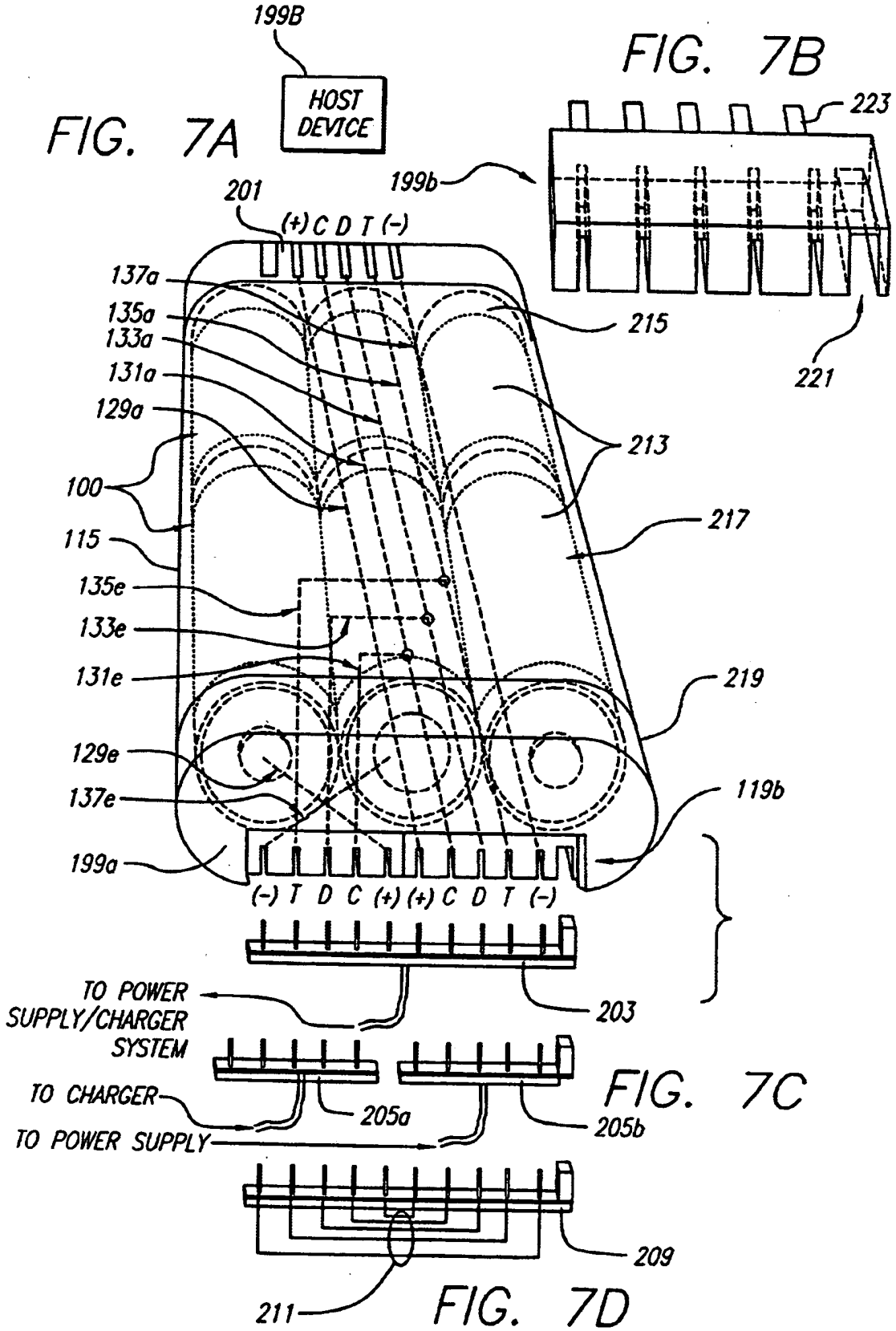


FIG. 7B

FIG. 7C

FIG. 7D

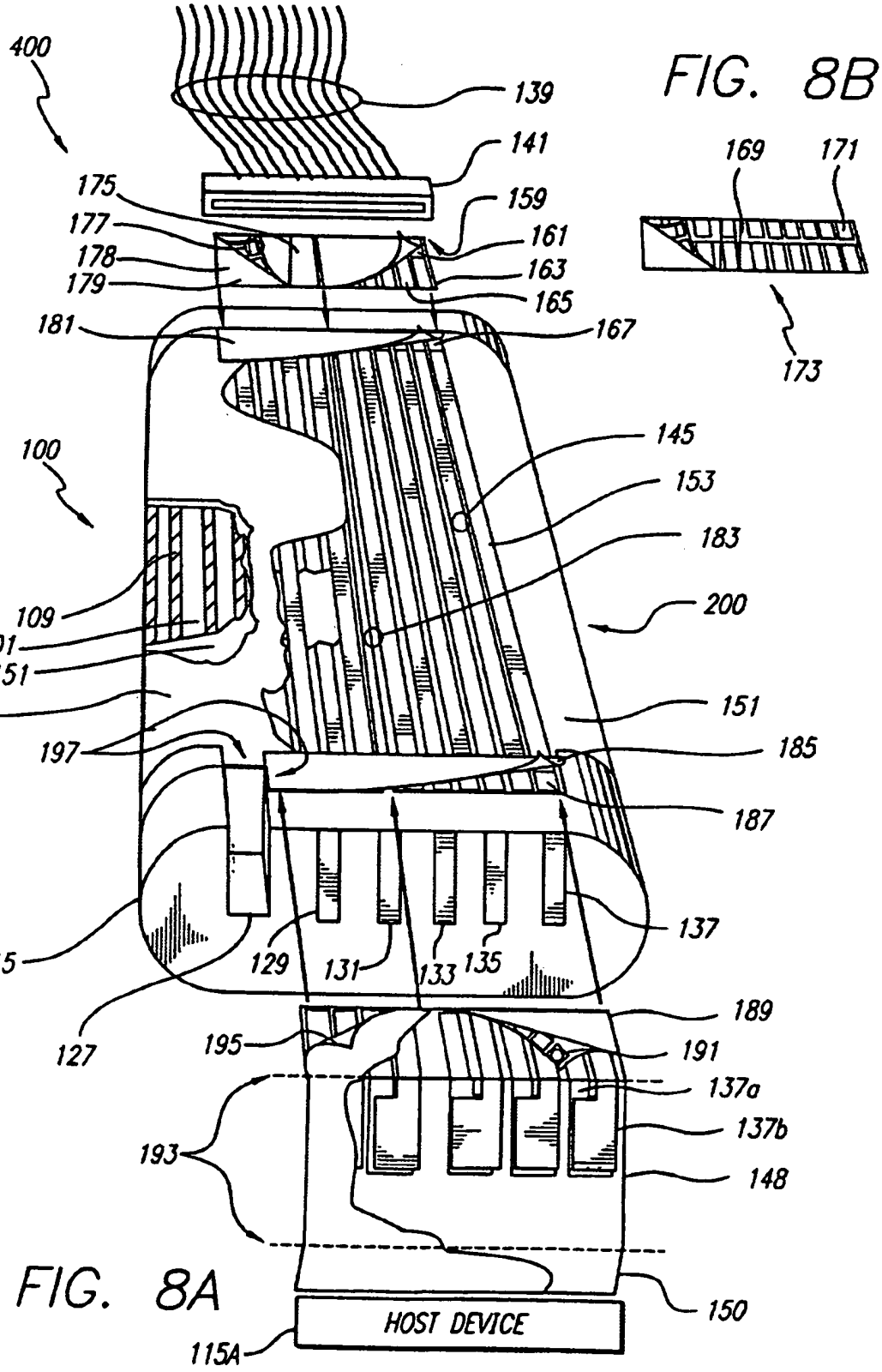

400
139
141
175
159
177
161
178
163
179
165
181
167
100
145
153
183
109
200
101
151
149
151
197
185
187
115
137
129
131
133
135
189
127
195
191
137a
193
137b
148
150
HOST DEVICE
115A

FIG. 8A

169
171
173

FIG. 8B

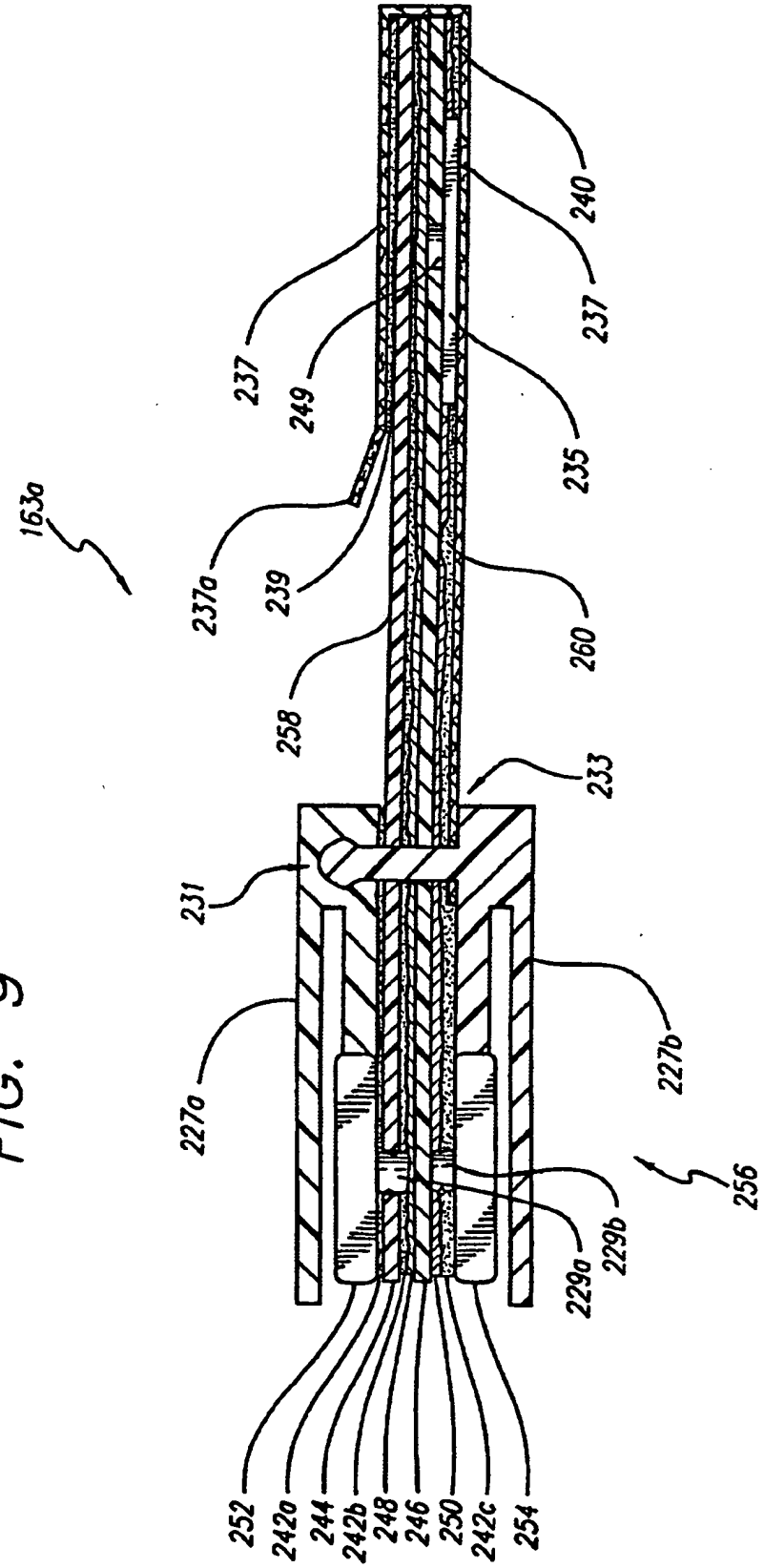

163a
237a
239
258
231
227a
252
242a
244
242b
248
246
250
242c
254
229a
229b
227b
256
233
260
235
237
249
237
240

FIG. 9

FIG. 10

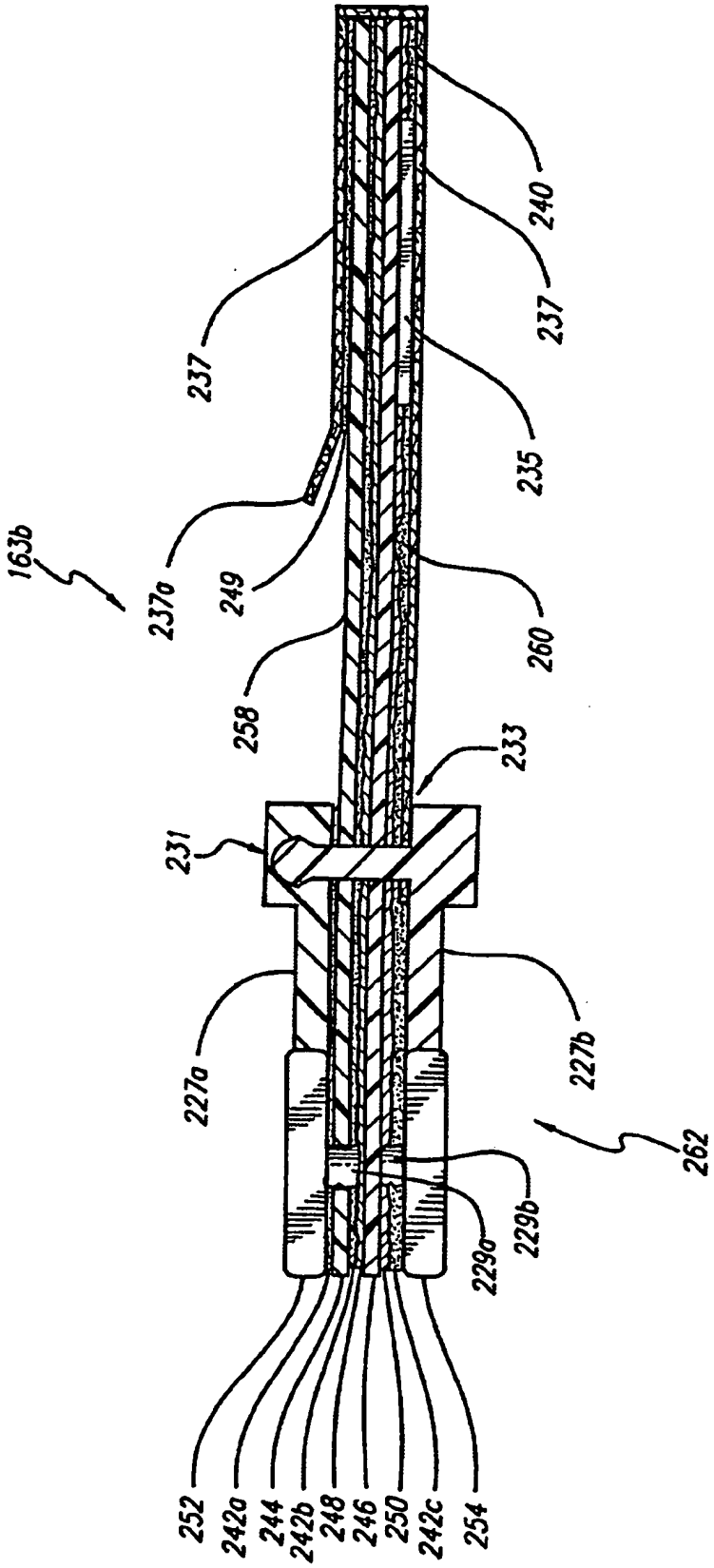

163b
237a
249
258
231
227a
252
242a
244
242b
248
246
250
242c
254
229a
229b
227b
262
233
260
235
237
237
240

FIG. 11

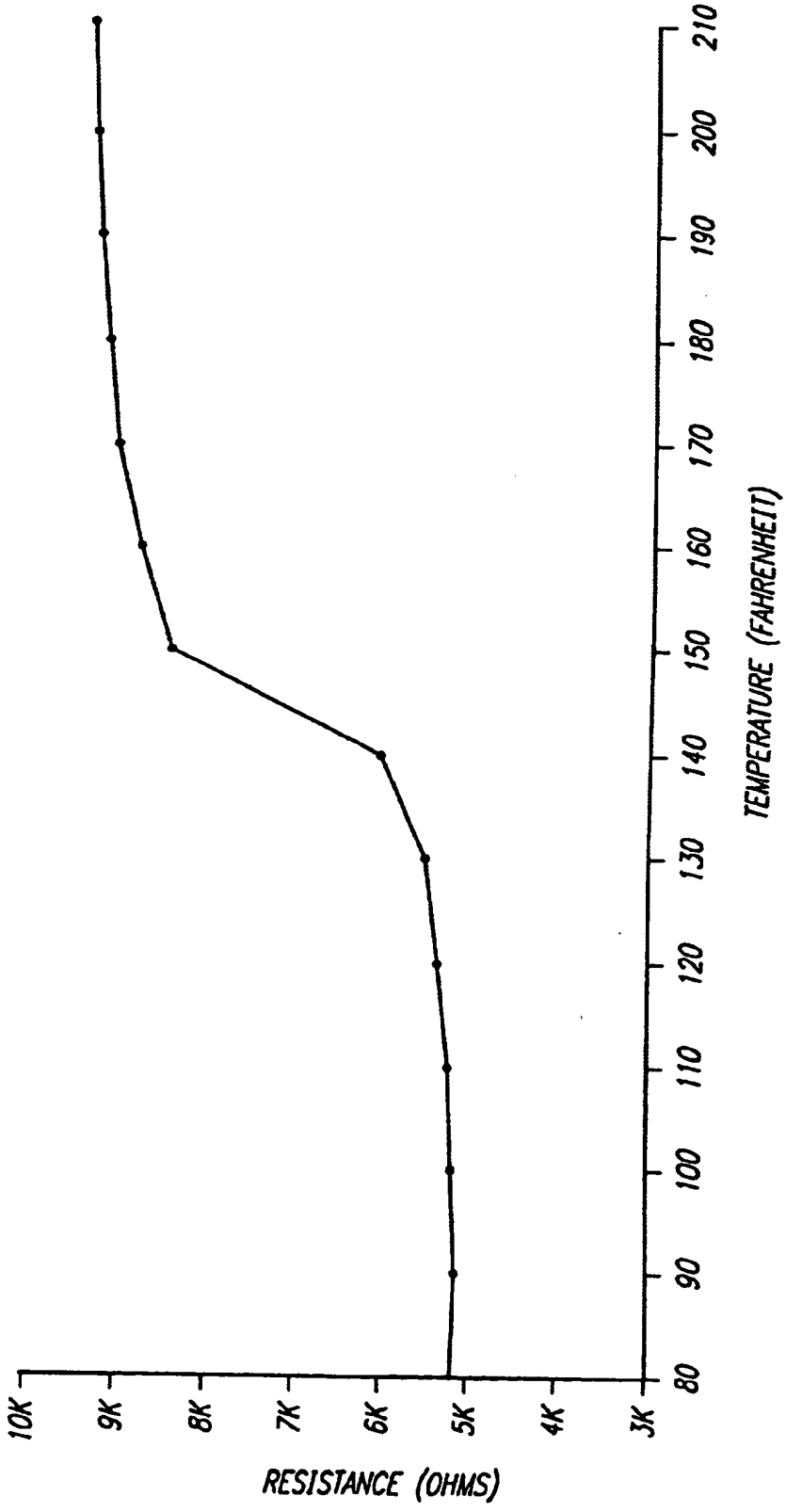

10K
9K
8K
7K
6K
5K
4K
3K
RESISTANCE (OHMS)
80
90
100
110
120
130
140
150
160
170
180
190
200
210
TEMPERATURE (FAHRENHEIT)

FIG. 12

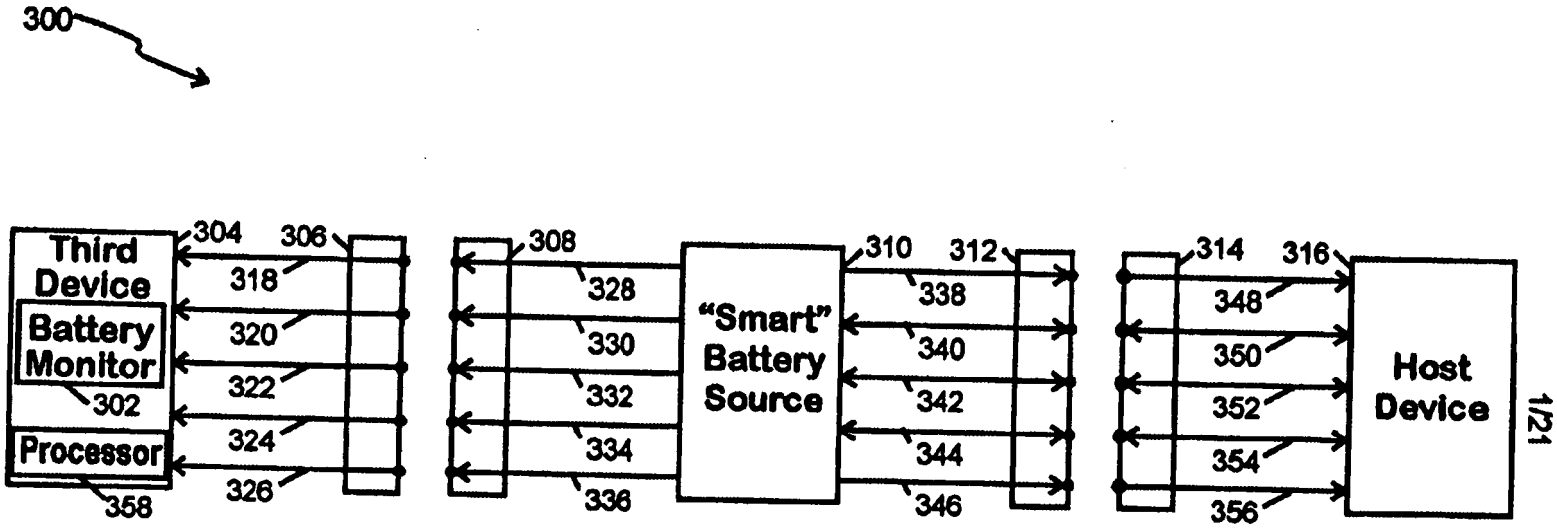

300
Third Device
Battery Monitor
302
Processor
358
304
306
318
320
322
324
326
308
328
330
332
334
336
"Smart" Battery Source
310
312
338
340
342
344
346
314
316
348
350
352
354
356
Host Device
1/21

FIG. 13

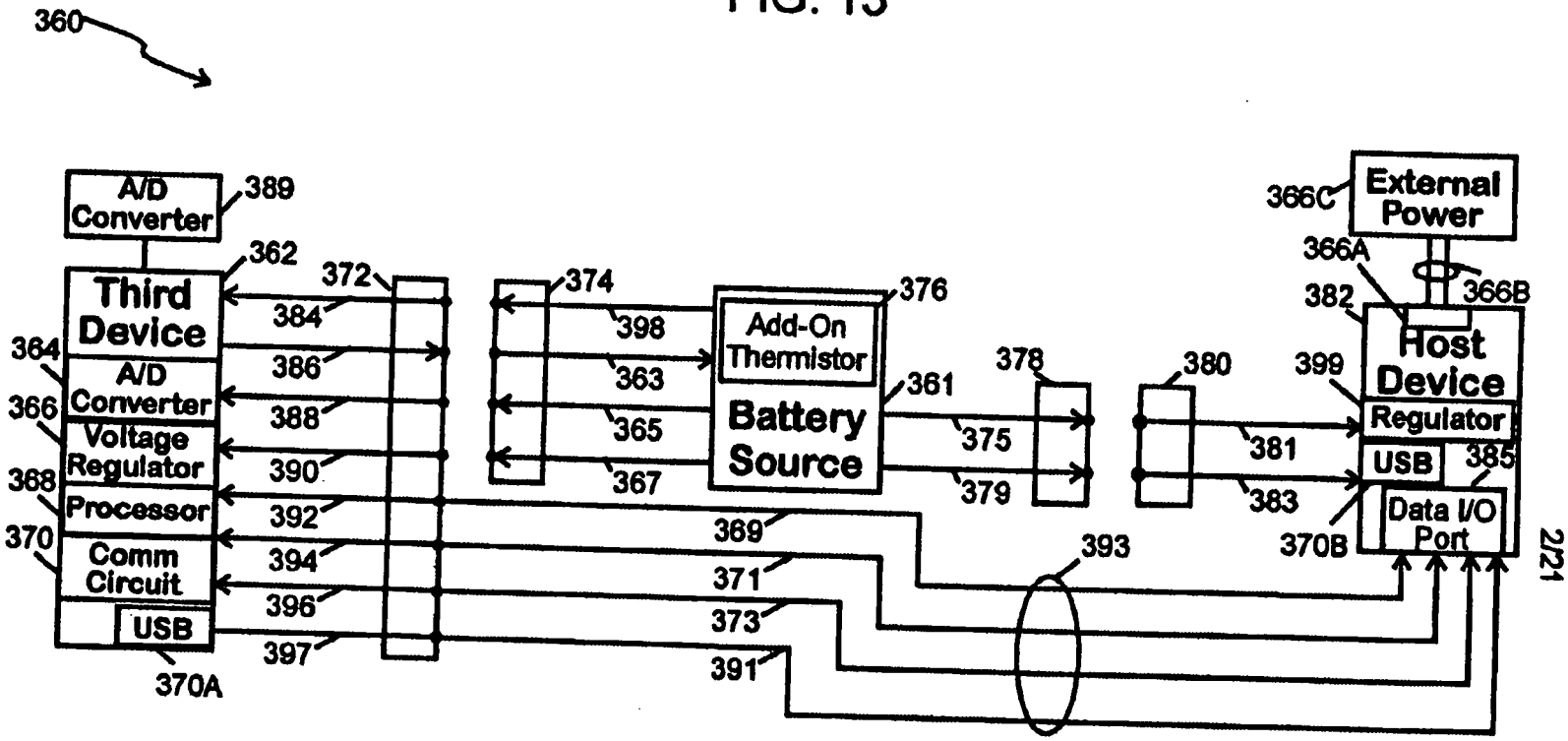

360
A/D Converter
389
Third Device
362
364
A/D Converter
366
Voltage Regulator
368
Processor
370
Comm Circuit
USB
370A
372
384
386
388
390
392
394
396
397
374
398
363
365
367
Add-On Thermistor
376
Battery Source
361
378
375
379
380
381
383
366C
External Power
366A
366B
382
Host Device
399
Regulator
USB
385
Data I/O Port
370B
369
371
373
391
393

FIG. 14A

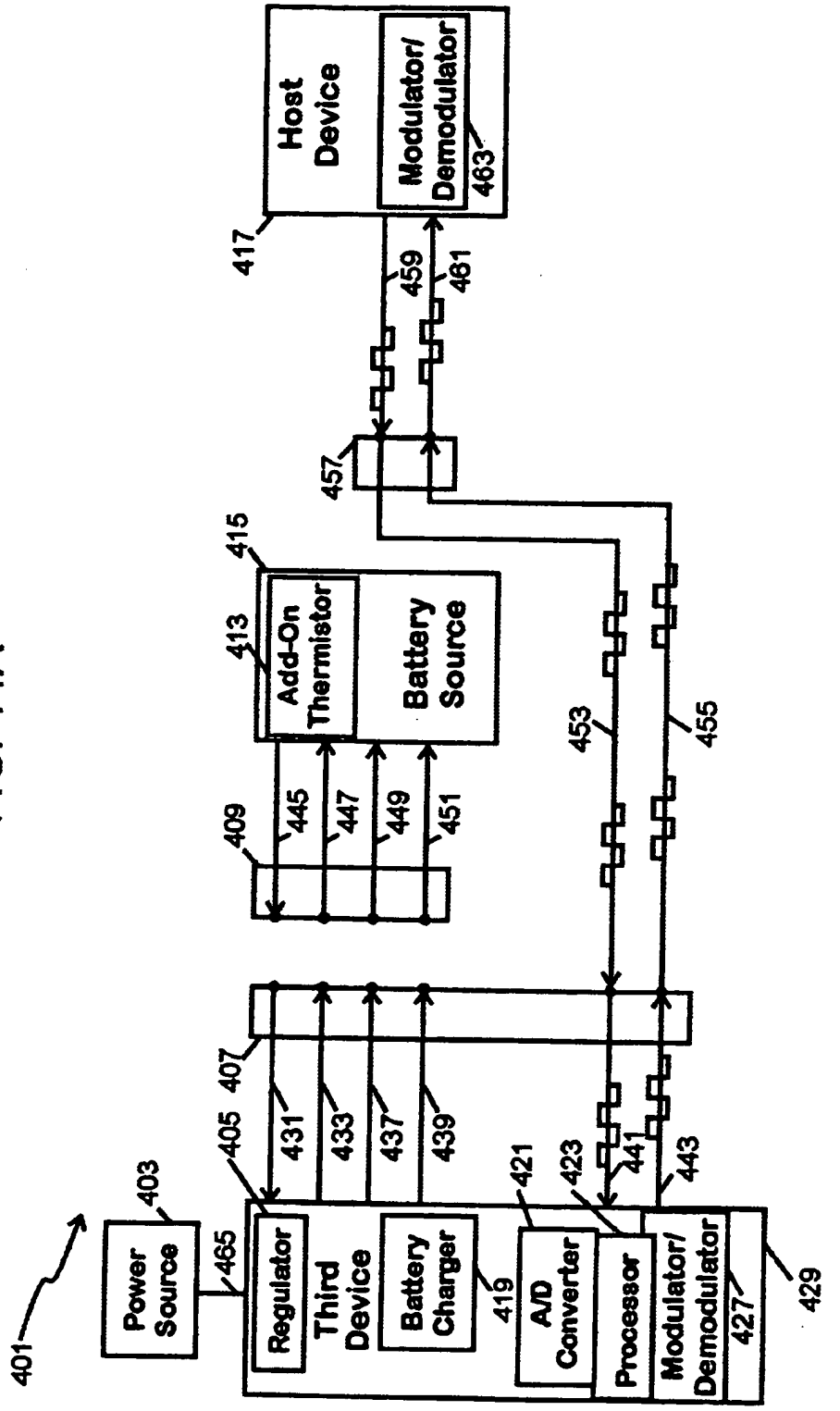
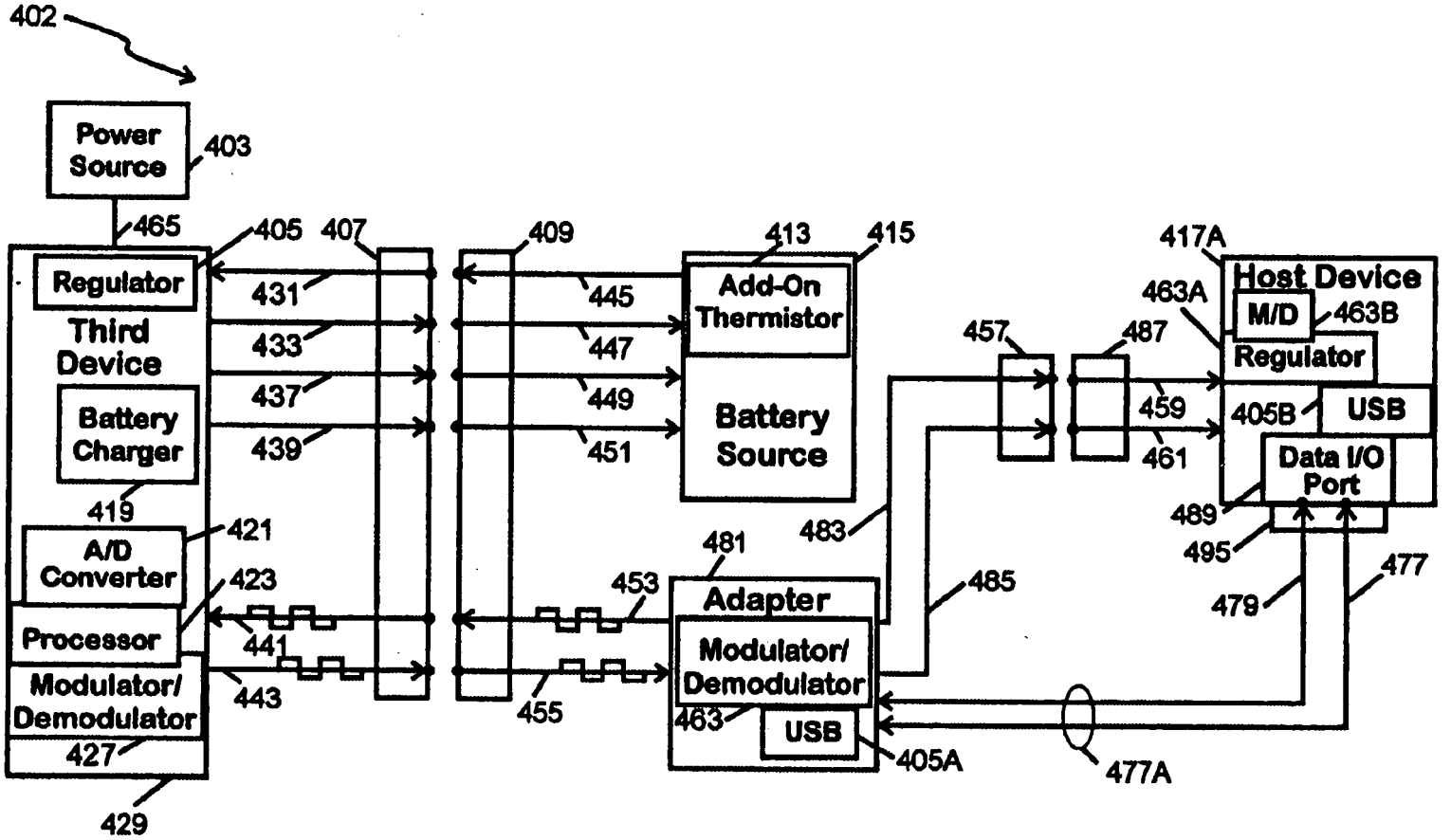

401
Power Source
403
465
Regulator
Third Device
Battery Charger
419
A/D Converter
421
Processor
423
Modulator/ Demodulator
427
429
405
407
431
433
437
439
441
443
409
445
447
449
451
Add-On Thermistor
413
Battery Source
415
453
455
457
Host Device
417
Modulator/ Demodulator
463
459
461

FIG. 14B


402
Power Source
403
465
405
407
409
413
415
417A
Host Device
Regulator
Third Device
Battery Charger
419
A/D Converter
421
Processor
423
Modulator/ Demodulator
427
429
431
433
437
439
441
443
445
447
449
451
455
Add-On Thermistor
Battery Source
481
Adapter
453
Modulator/ Demodulator
463
USB
405A
457
483
485
487
459
461
463A
M/D
463B
Regulator
405B
USB
Data I/O Port
489
495
479
477
477A
421

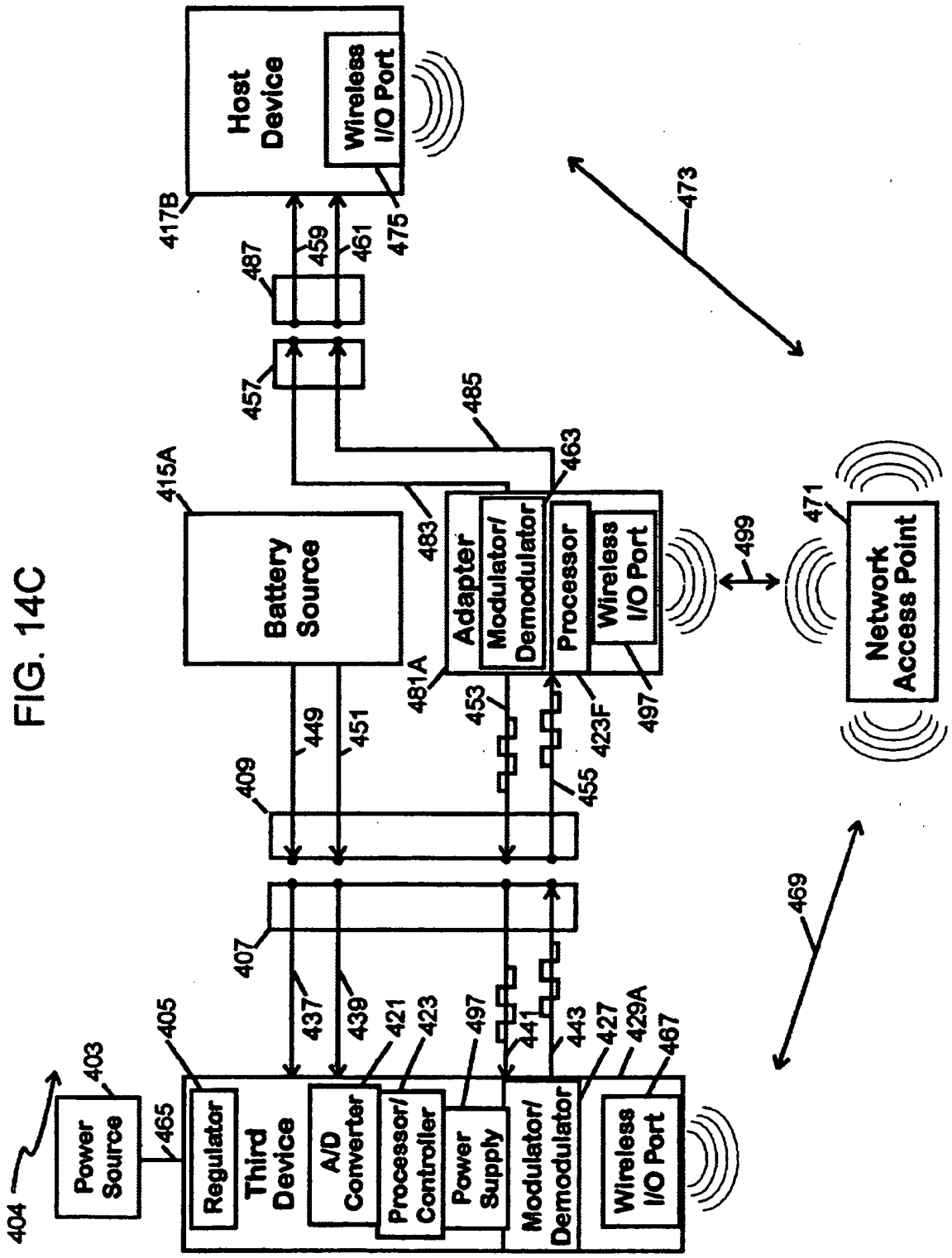

Host Device
Wireless I/O Port
417B
475
459
461
487
457
485
473
415A
Battery Source
483
Adapter
Modulator/ Demodulator
Processor
Wireless I/O Port
463
481A
453
455
423F
497
499
471
Network Access Point
449
451
409
469
407
437
439
421
423
497
441
443
427
429A
467
405
403
404
Power Source
465
Regulator
Third Device
A/D Converter
Processor/ Controller
Power Supply
Modulator/ Demodulator
Wireless I/O Port

FIG. 14C

FIG. 14D

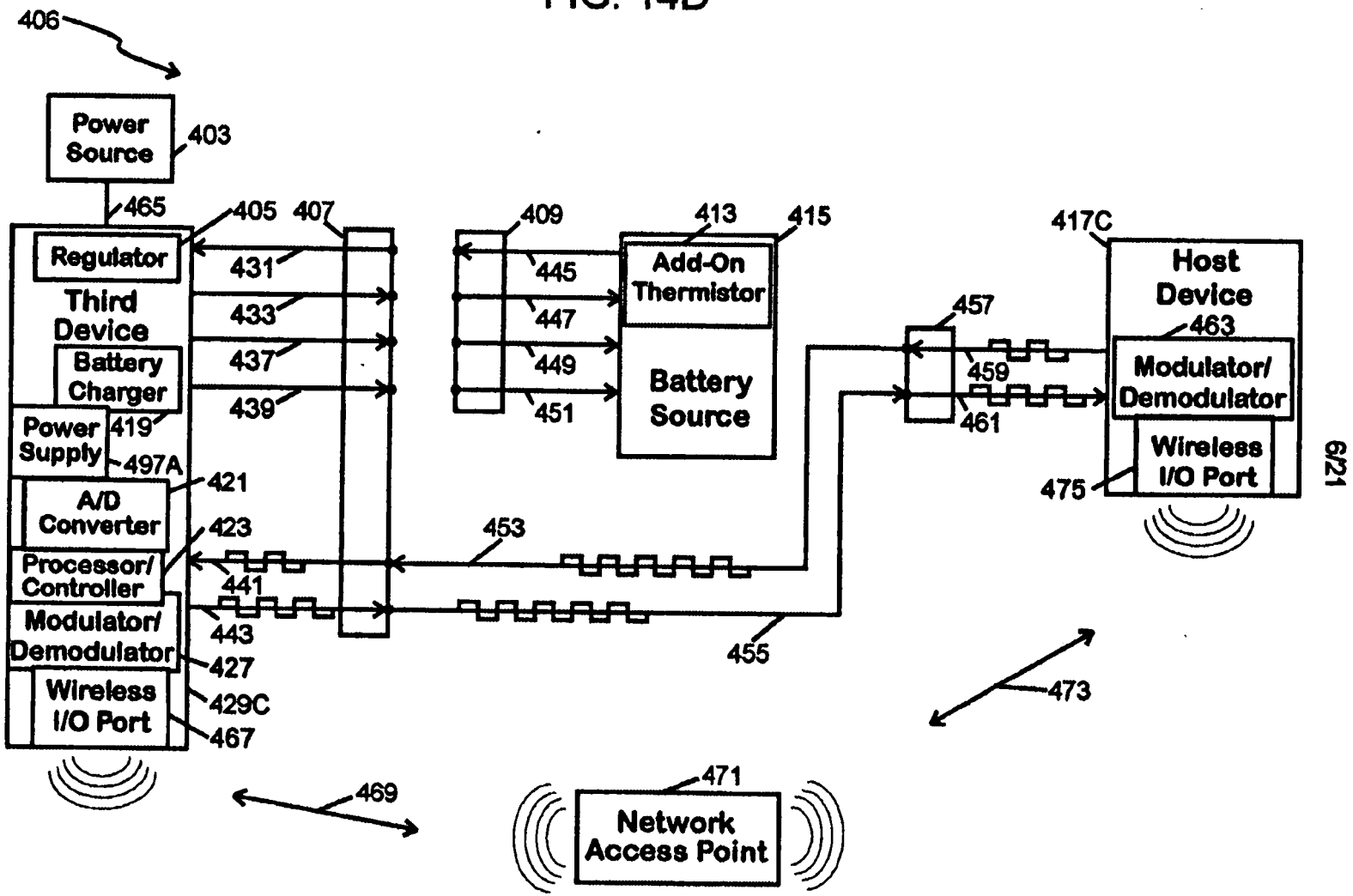

406
Power Source
403
465
405
407
409
413
415
417C
Regulator
Third Device
Battery Charger
Power Supply
419
497A
A/D Converter
Processor/ Controller
Modulator/ Demodulator
Wireless I/O Port
467
431
433
437
439
421
423
441
443
427
429C
445
447
449
451
Add-On Thermistor
Battery Source
453
455
457
459
461
Host Device
463
Modulator/ Demodulator
Wireless I/O Port
475
473
469
471
Network Access Point

FIG. 14E

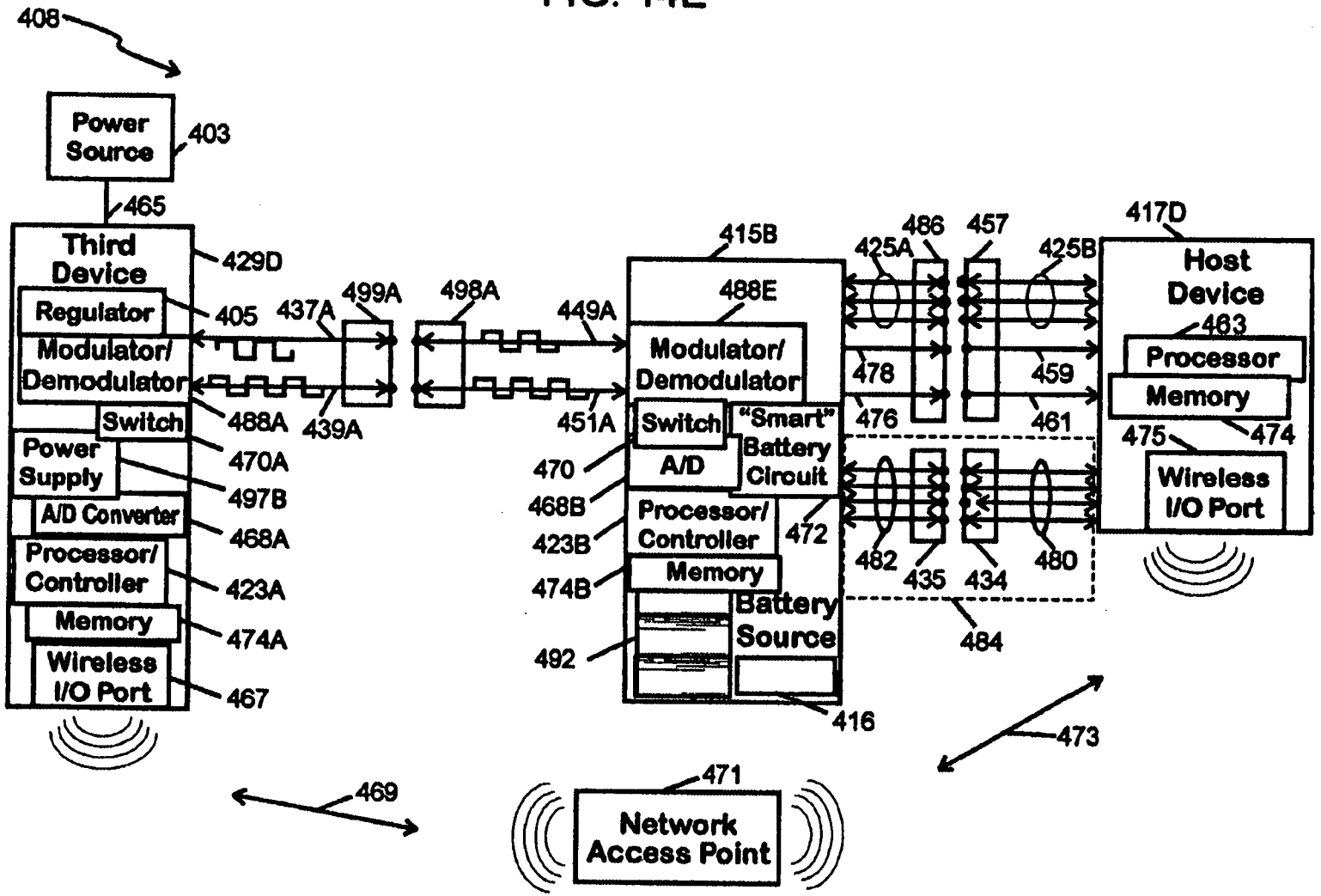

408
Power Source
403
465
Third Device
429D
Regulator
405
Modulator/ Demodulator
488A
Switch
470A
Power Supply
497B
A/D Converter
468A
Processor/ Controller
423A
Memory
474A
Wireless I/O Port
467
437A
499A
439A
498A
449A
451A
415B
488E
Modulator/ Demodulator
Switch
A/D
"Smart" Battery Circuit
470
468B
423B
474B
Processor/ Controller
472
Memory
Battery Source
492
416
486
457
425A
425B
478
459
476
461
482
435
434
480
484
417D
Host Device
463
Processor
Memory
475
474
Wireless I/O Port
7/21
473
469
471
Network Access Point

FIG. 14F

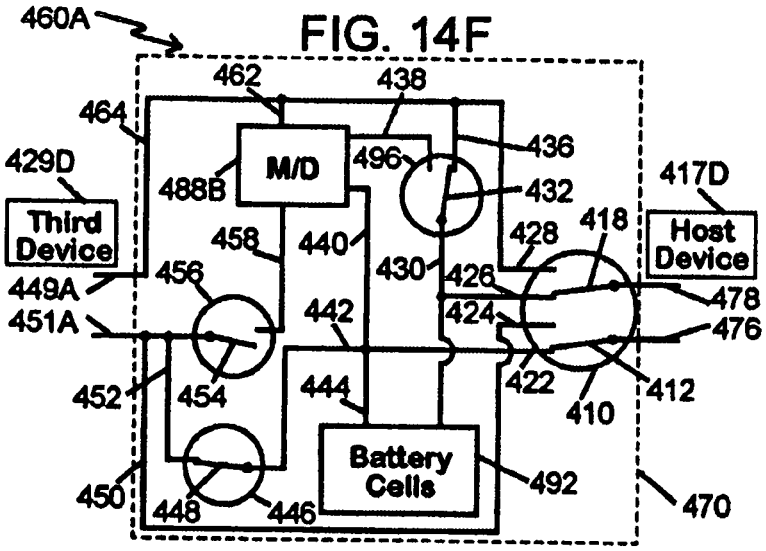


FIG. 14G

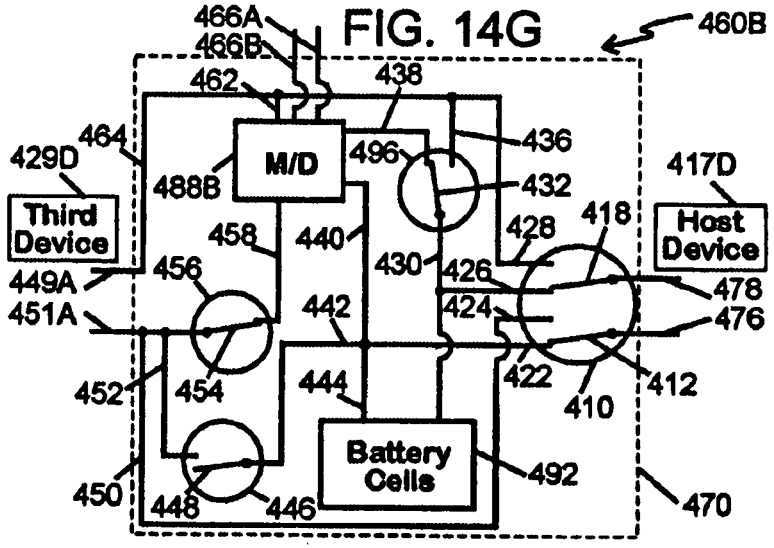


FIG. 14H

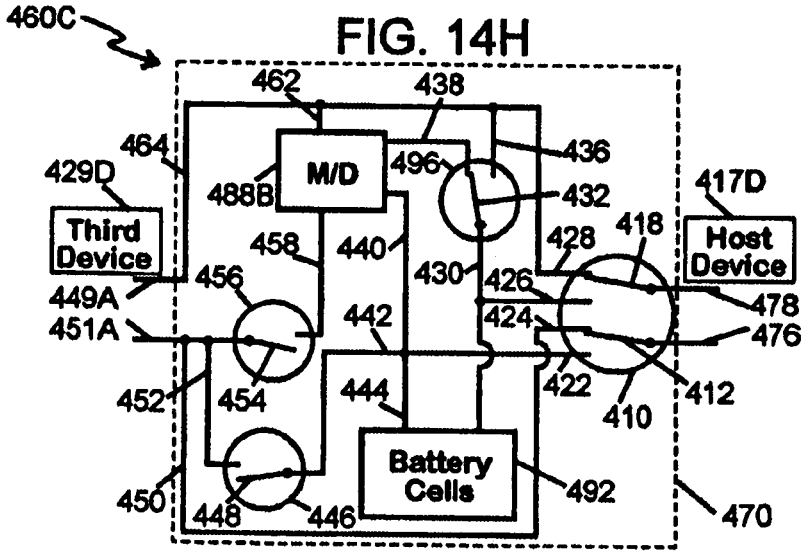


FIG. 14I

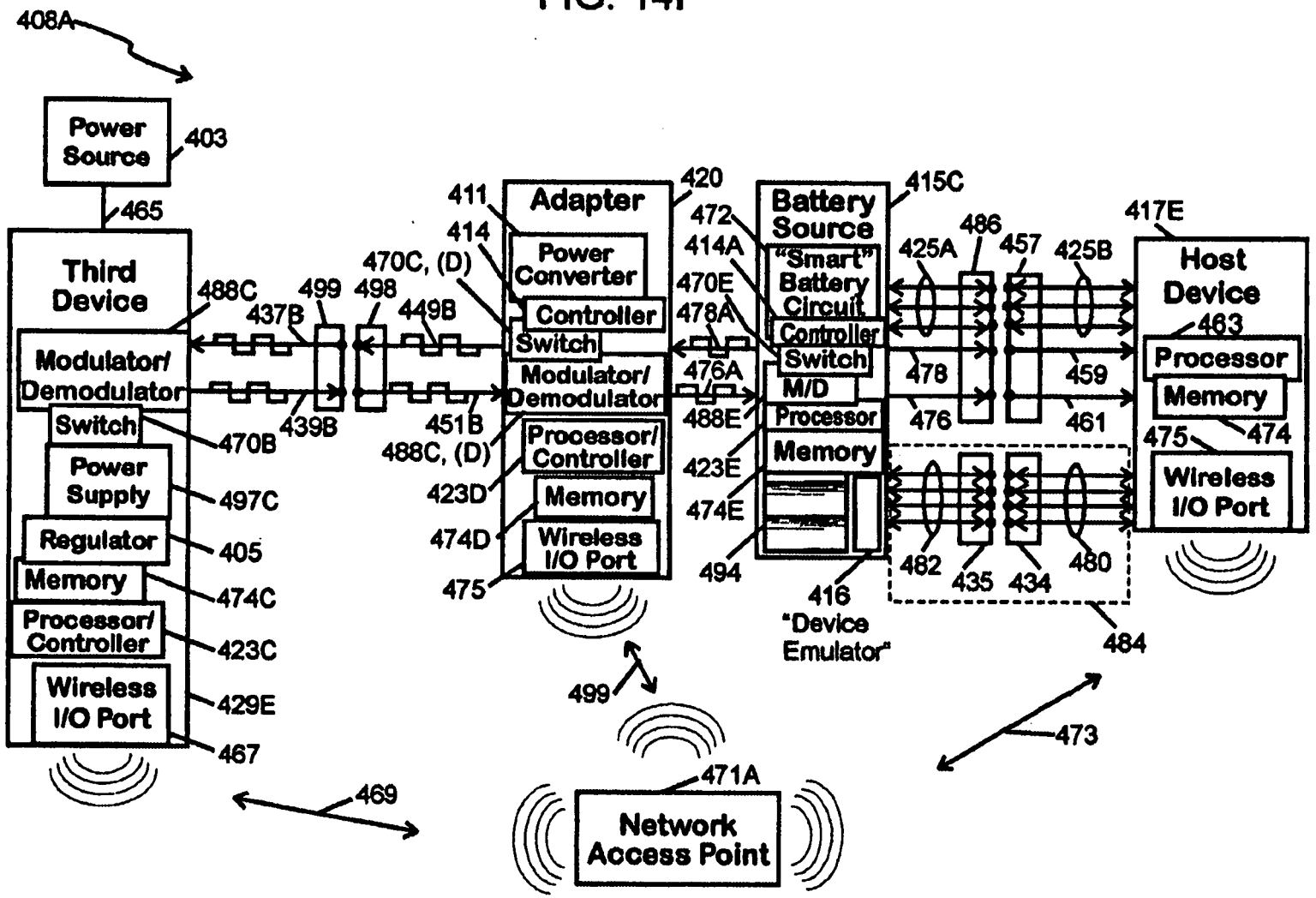

408A
Power Source
403
465
Third Device
488C
437B
499
498
449B
470C, (D)
Modulator/ Demodulator
Switch
470B
439B
451B
488C, (D)
Power Supply
497C
Regulator
405
Memory
474C
Processor/ Controller
423C
Wireless I/O Port
429E
467
469
411
Adapter
420
414
Power Converter
Controller
Switch
Modulator/ Demodulator
Processor/ Controller
423D
Memory
474D
Wireless I/O Port
475
499
471A
Network Access Point
472
414A
470E
478A
476A
488E
423E
474E
494
Battery Source
415C
"Smart" Battery Circuit
Controller
Switch
M/D
Processor
Memory
416
"Device Emulator"
425A
486
457
425B
478
476
459
461
482
435
434
480
484
473
417E
Host Device
463
Processor
Memory
475
474
Wireless I/O Port

FIG. 15

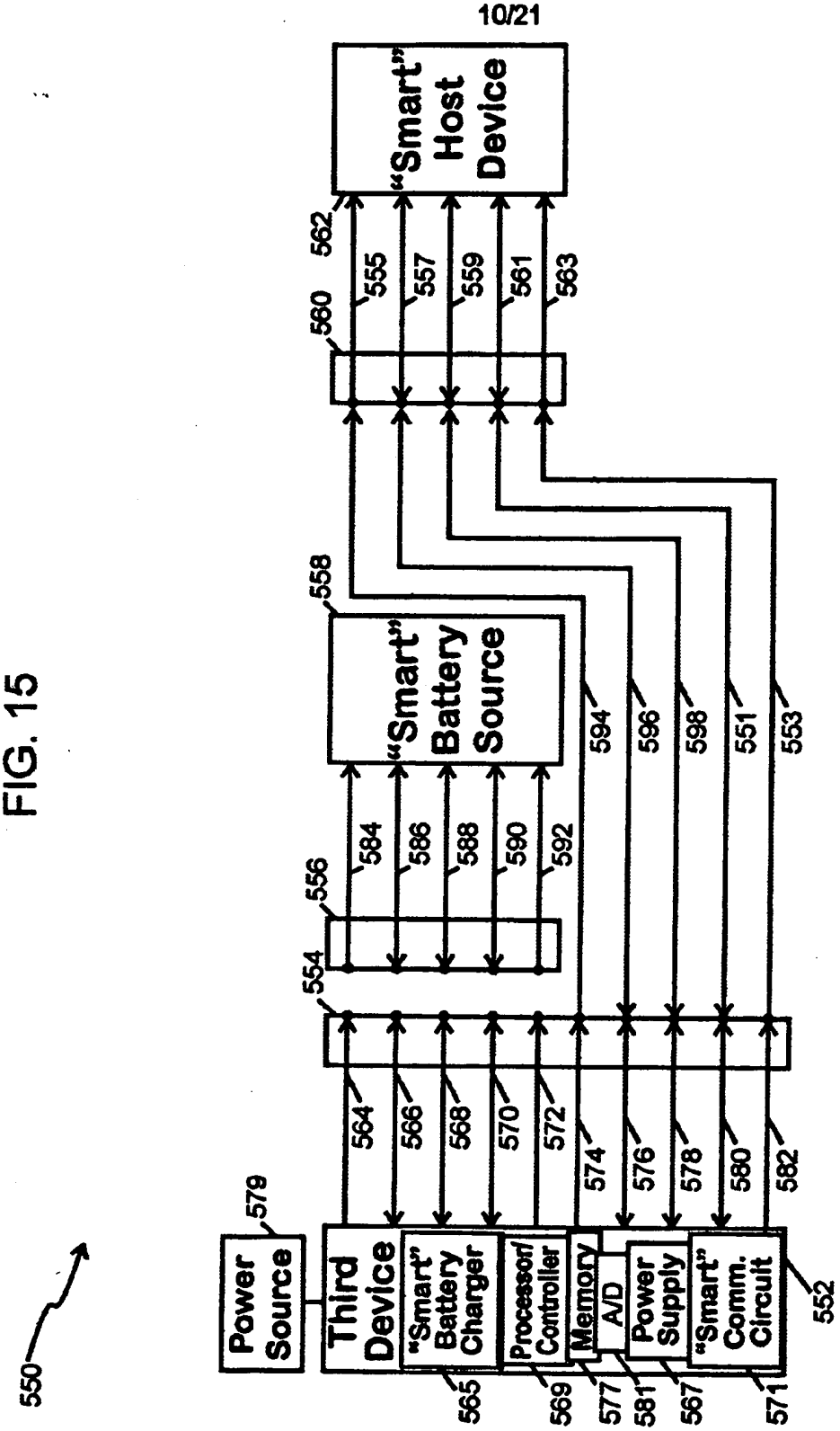

550
Power Source
579
Third Device
"Smart" Battery Charger
Processor/ Controller
Memory
A/D
Power Supply
"Smart" Comm. Circuit
552
565
569
577
581
567
571
564
566
568
570
572
574
576
578
580
582
554
556
584
586
588
590
592
"Smart" Battery Source
558
594
596
598
551
553
560
562
555
557
559
561
563
"Smart" Host Device

FIG. 16

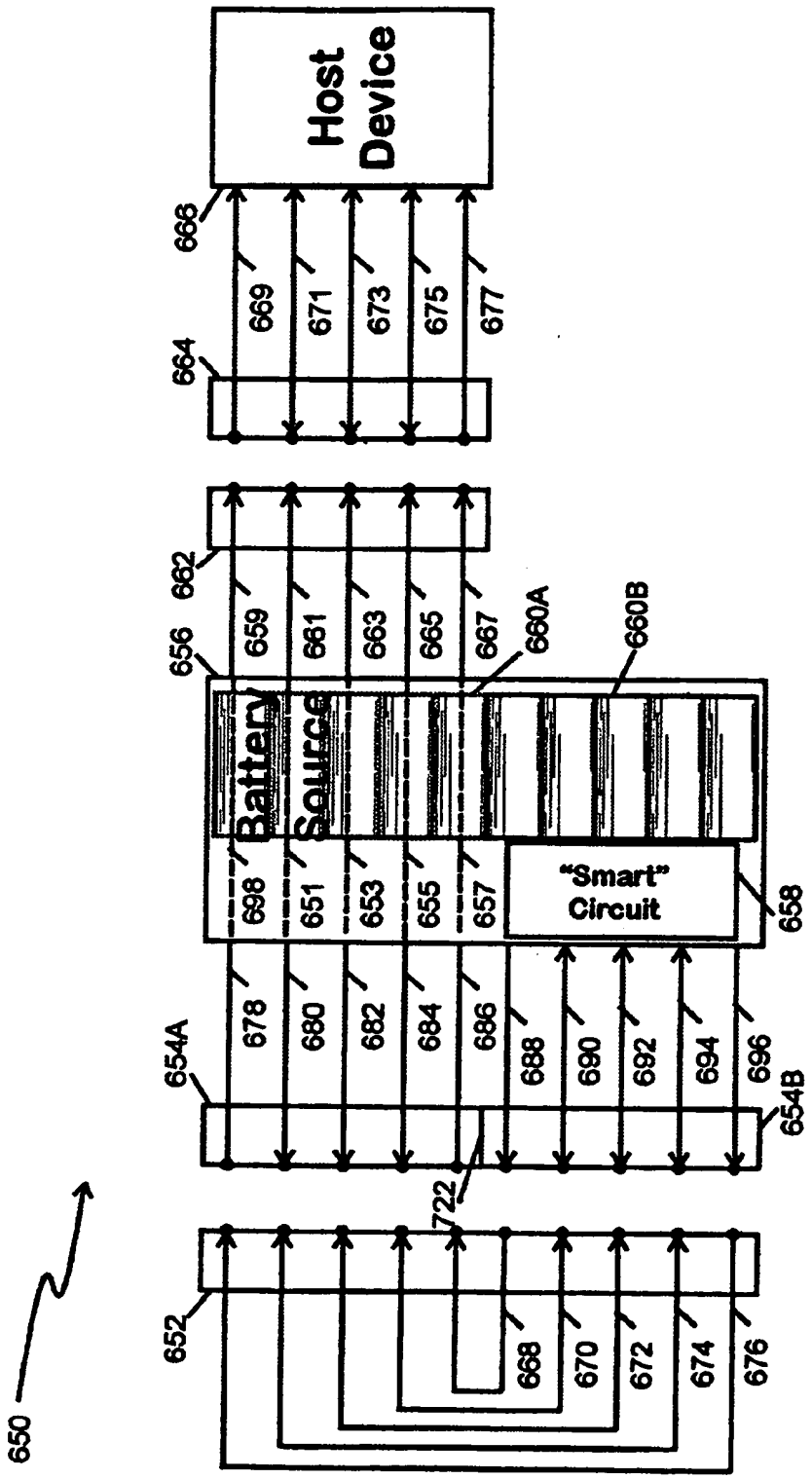

Host Device
666
669
671
673
675
677
664
662
659
661
663
665
667
656
660A
660B
Battery Source
"Smart" Circuit
658
698
651
653
655
657
678
680
682
684
686
688
690
692
694
696
654A
654B
722
652
668
670
672
674
676
650

FIG. 17

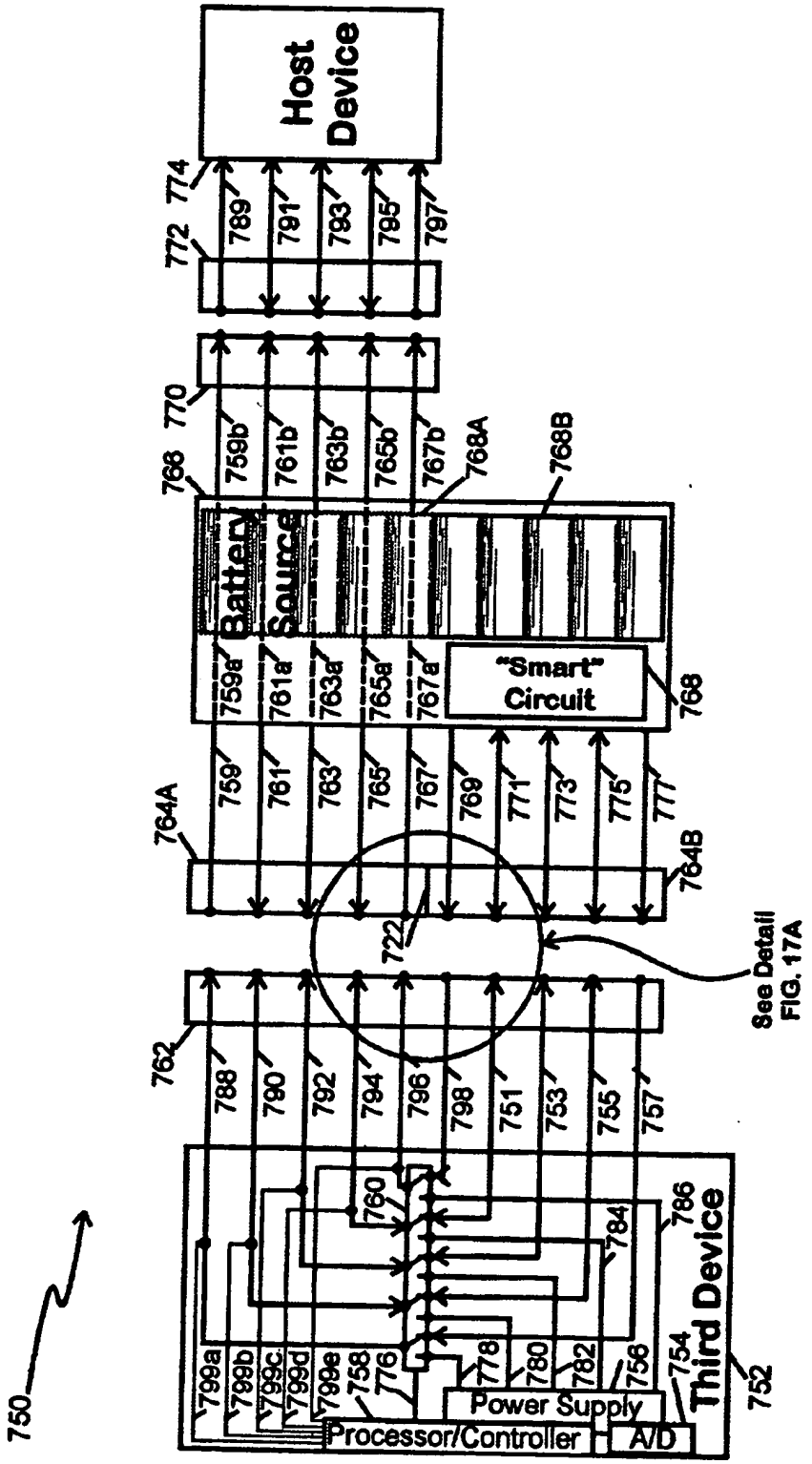

Host Device
774
772
789
791
793
795
797
770
768
759b
761b
763b
765b
767b
768A
768B
Battery Source
"Smart" Circuit
768
759a
761a
763a
765a
767a
759
761
763
765
767
769
771
773
775
777
764A
764B
722
See Detail FIG. 17A
762
788
790
792
794
796
798
751
753
755
757
760
784
786
Third Device
752
754
756
758
776
778
780
782
799a
799b
799c
799d
799e
Power Supply
Processor/Controller
A/D
750

FIG. 17A

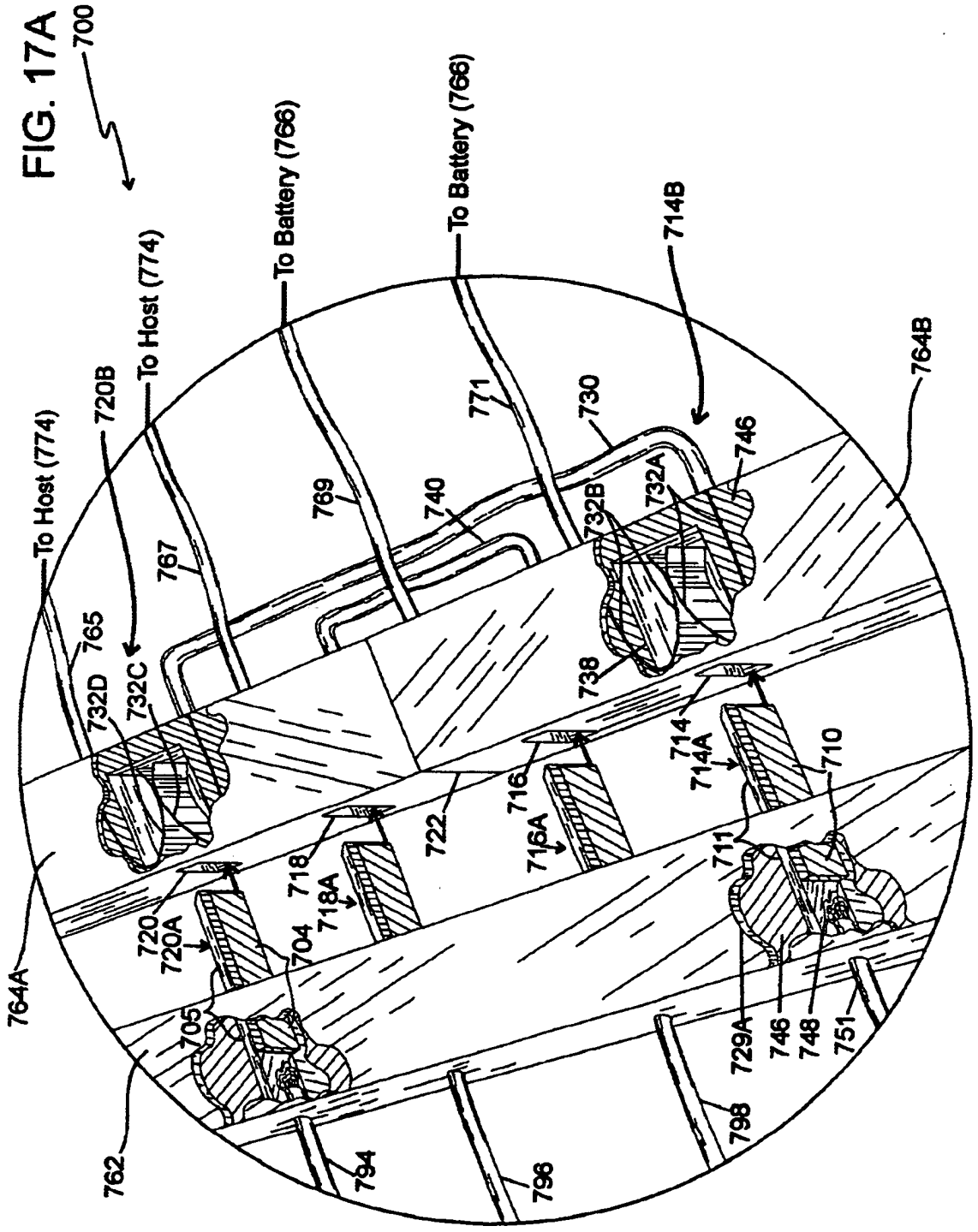

700
To Host (774)
720B
To Host (774)
To Battery (766)
To Battery (766)
714B
764B
771
730
746
732A
732B
740
789
767
765
732D
732C
738
714
714A
710
716
716A
722
718
718A
720
720A
704
705
711
764A
762
729A
746
748
751
794
796
798

FIG. 17B

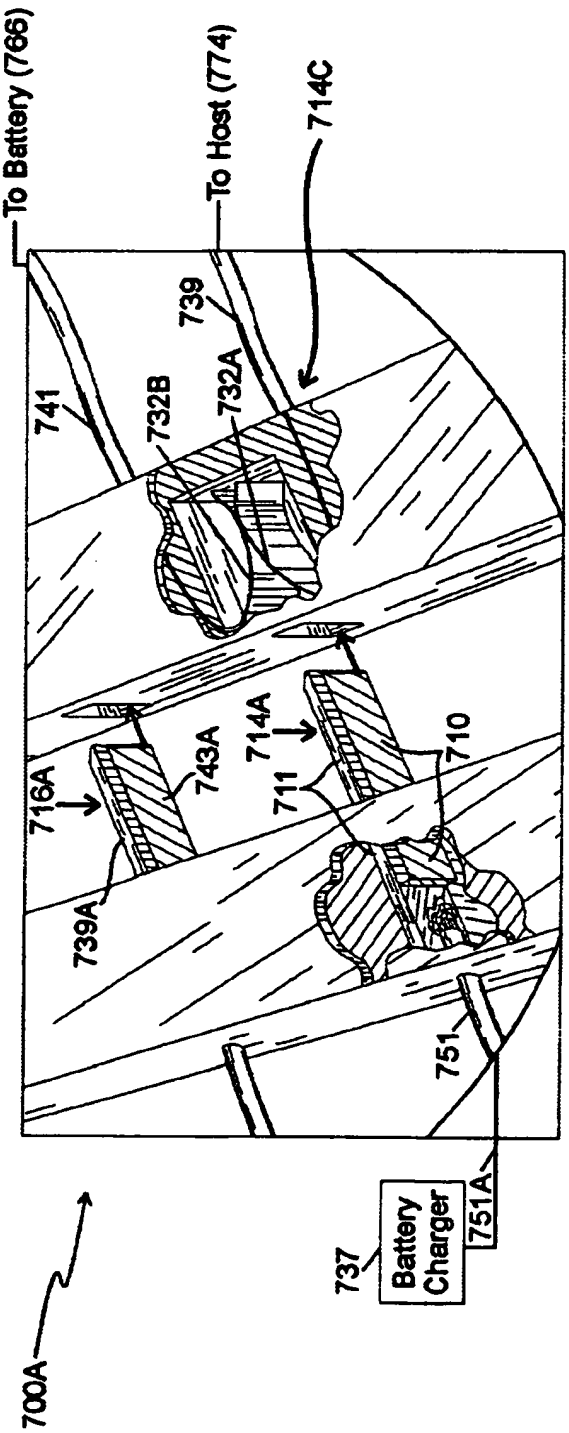

To Battery (766)
To Host (774)
714C
739
741
732B
732A
716A
743A
714A
711
710
739A
751
737
Battery Charger
751A
700A

FIG. 17C

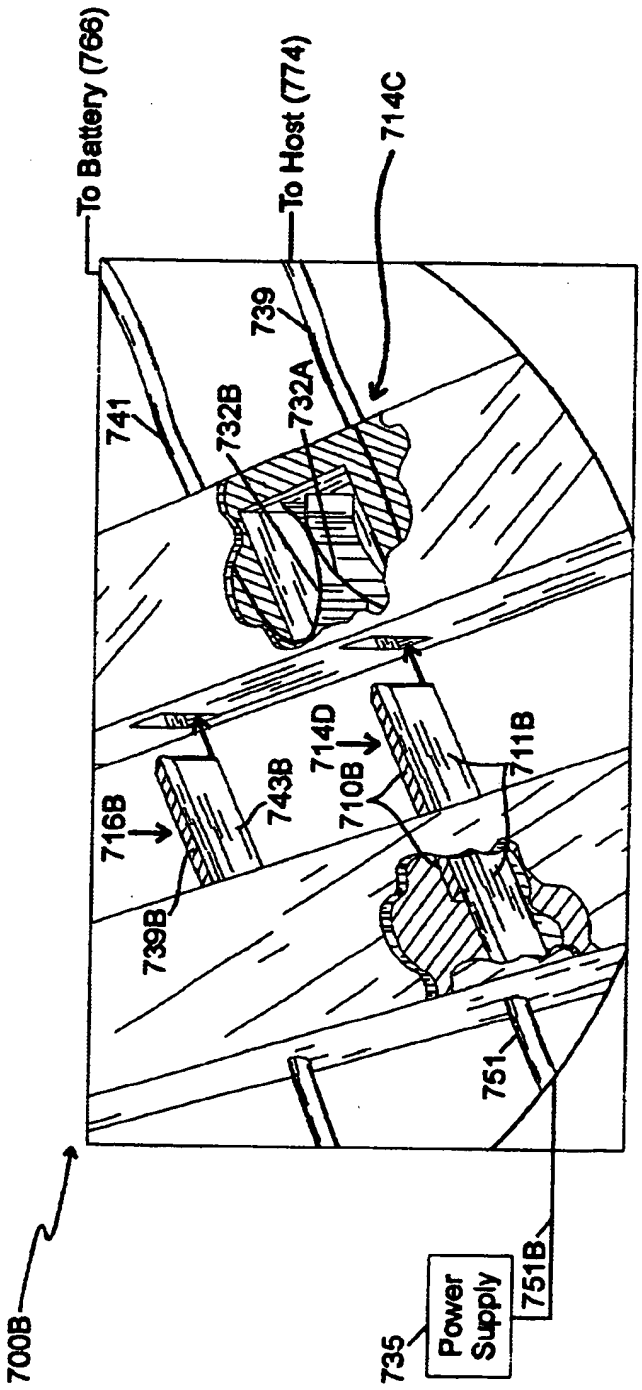

To Battery (766)
To Host (774)
714C
739
741
732B
732A
714D
710B
711B
716B
743B
739B
751
700B
735
Power Supply
751B

FIG. 18A

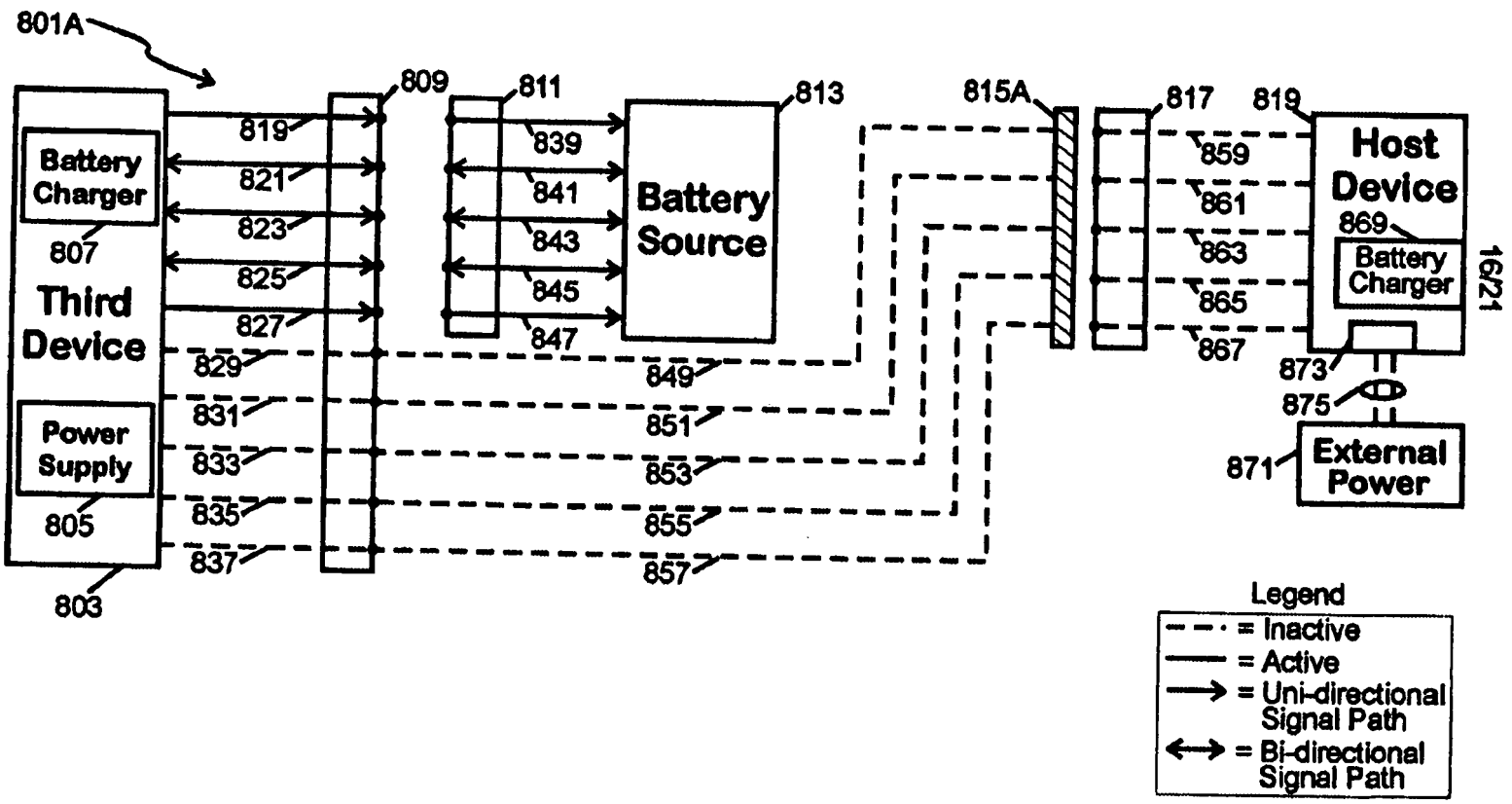

801A
Battery Charger
807
Third Device
Power Supply
805
803
809
811
813
Battery Source
815A
817
819
Host Device
869
Battery Charger
873
875
871
External Power
819
821
823
825
827
829
831
833
835
837
839
841
843
845
847
849
851
853
855
857
859
861
863
865
867
Legend
= Inactive
= Active
= Uni-directional Signal Path
= Bi-directional Signal Path
16/21

FIG. 18B

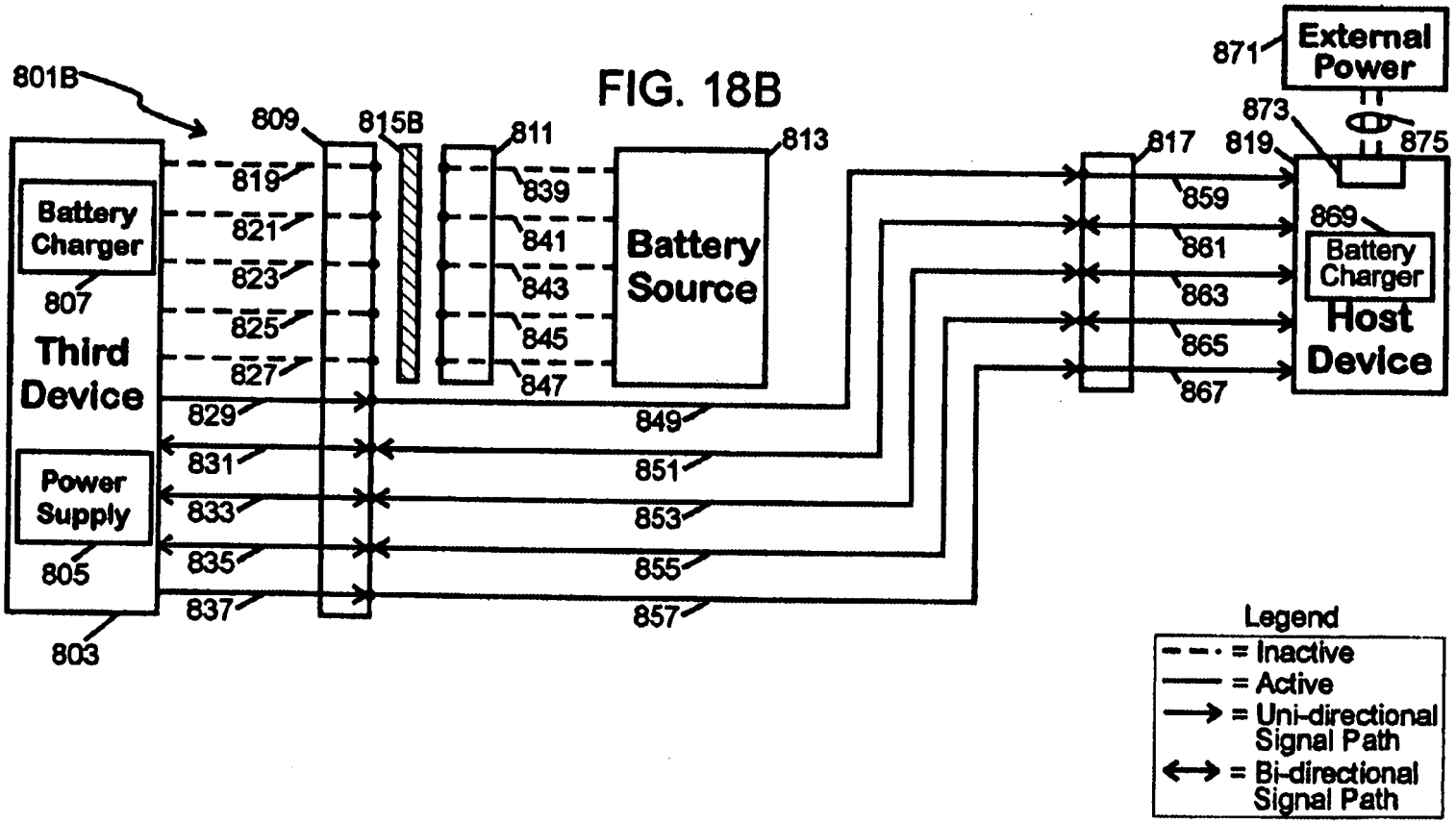

801B
809
815B
811
813
817
819
871
External Power
873
875
Battery Charger
807
Third Device
Power Supply
805
803
819
821
823
825
827
829
831
833
835
837
839
841
843
845
847
Battery Source
849
851
853
855
857
859
861
863
865
867
869
Battery Charger
Host Device
17721
Legend
= Inactive
= Active
= Uni-directional Signal Path
= Bi-directional Signal Path

FIG. 19A

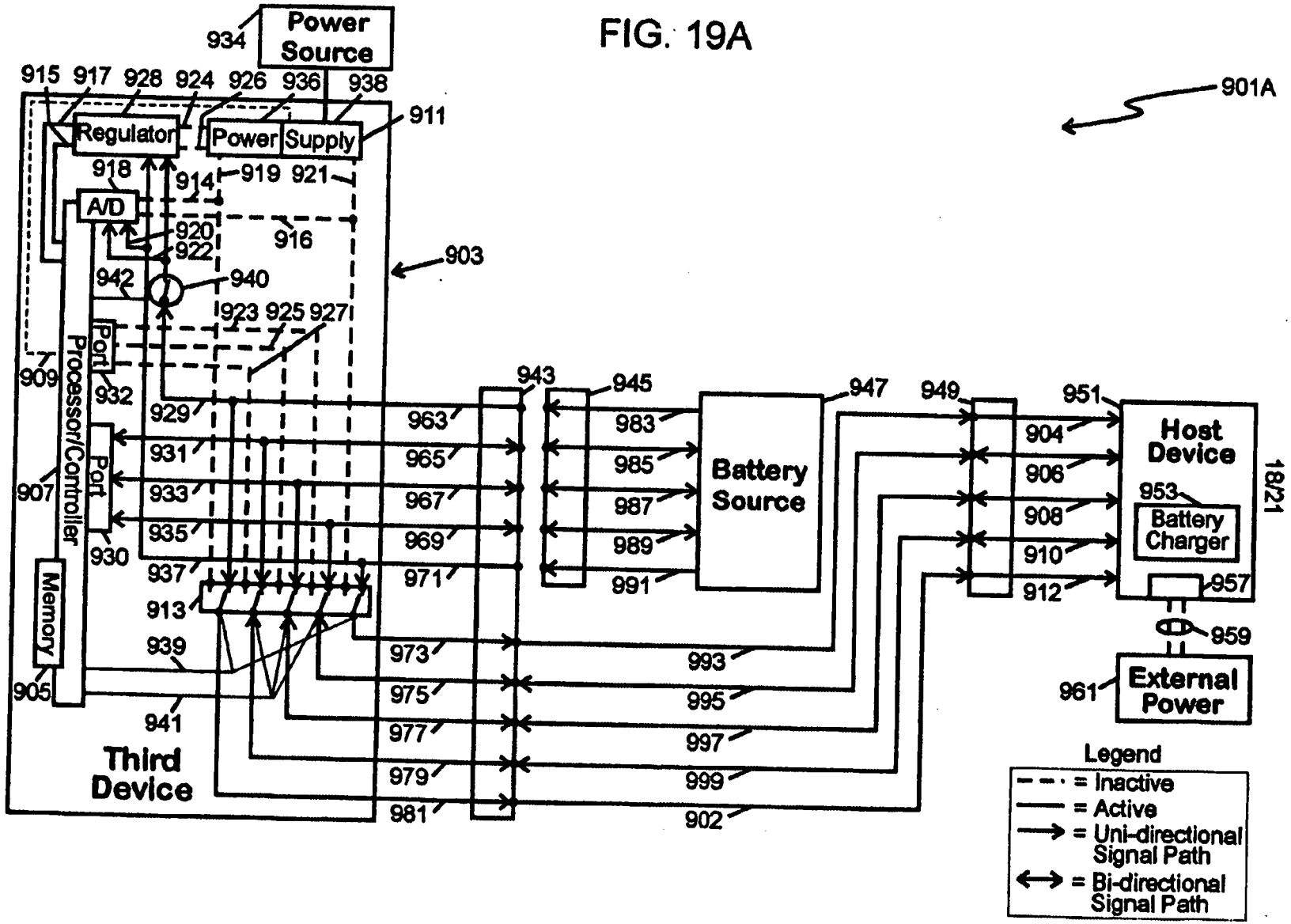

901A
Power Source
934
915 917 928 924 926 936 938
911
Regulator
Power Supply
918
914
919 921
A/D
920
922
916
903
942
940
923 925 927
Port
932
909
Processor/Controller
907
Port
930
Memory
905
939
941
Third Device
929
931
933
935
937
913
943
945
963
965
967
969
971
973
975
977
979
981
983
985
987
989
991
Battery Source
947
949
993
995
997
999
902
951
904
906
908
910
912
Host Device
953
Battery Charger
957
959
961
External Power
18/21
Legend
= Inactive
= Active
= Uni-directional Signal Path
= Bi-directional Signal Path

FIG. 19B

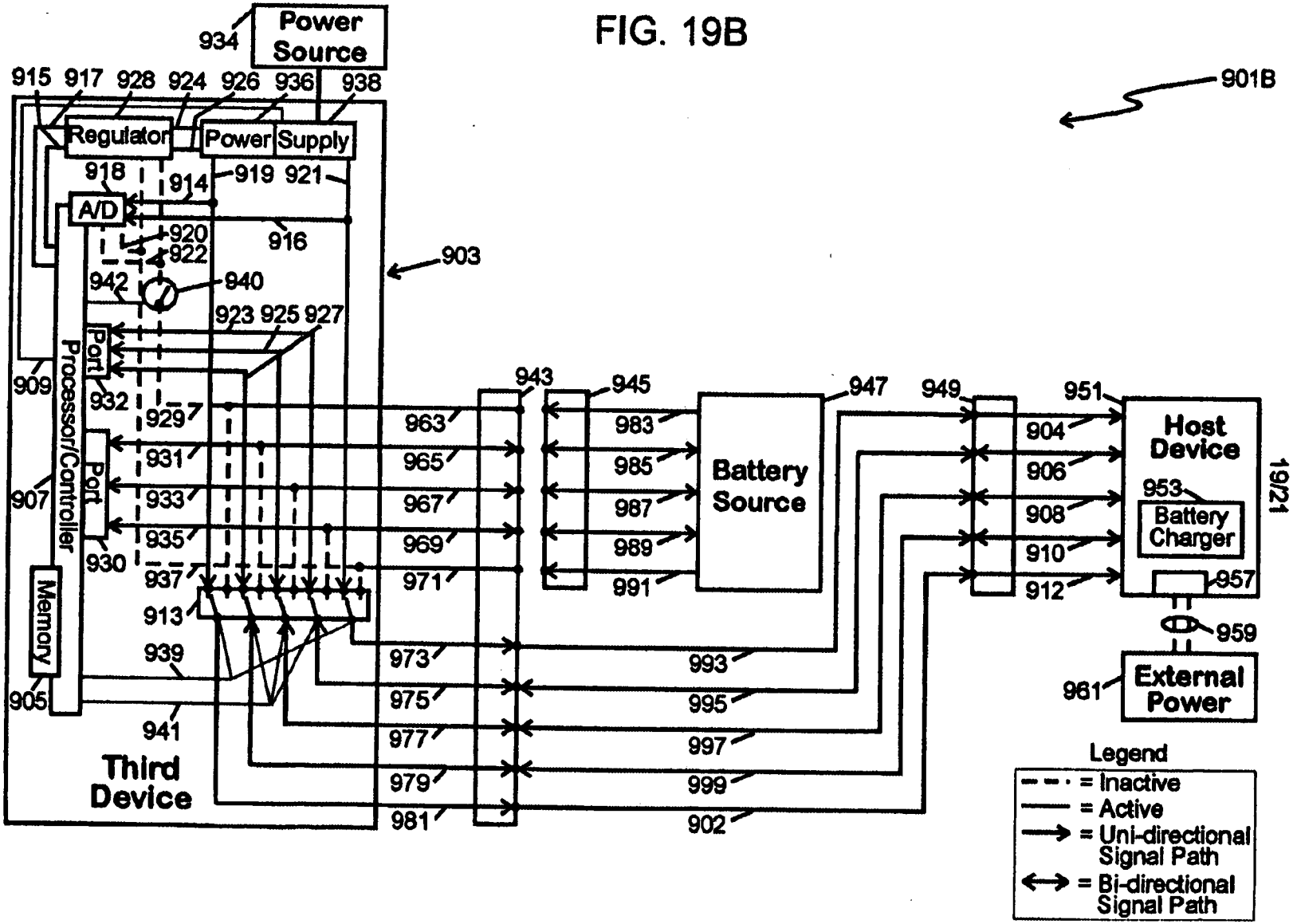

Power Source
934
915 917 928 924 926 936 938
Regulator
Power Supply
918
914
919 921
A/D
920
922
916
903
942
940
923 925 927
Port
909
932
929
963
943
945
983
947
949
951
904
Host Device
Processor/Controller
Port
907
931
965
985
Battery Source
906
953
Battery Charger
933
967
987
908
910
957
935
969
989
930
937
971
991
912
913
959
Memory
939
973
993
961
External Power
905
941
975
995
977
997
Third Device
979
999
981
902
901B
19/21
Legend
= Inactive
= Active
= Uni-directional Signal Path
= Bi-directional Signal Path

FIG. 19C

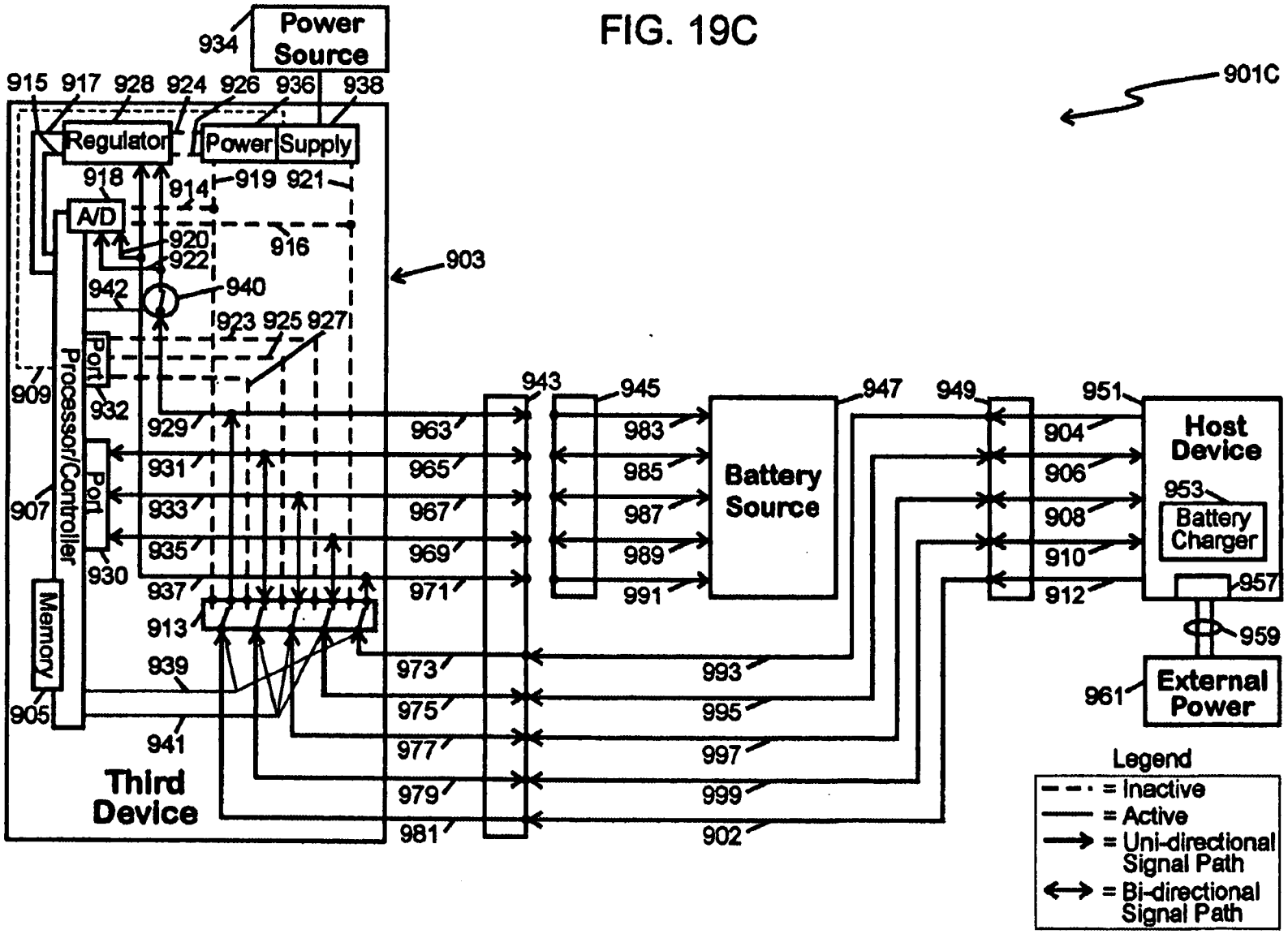
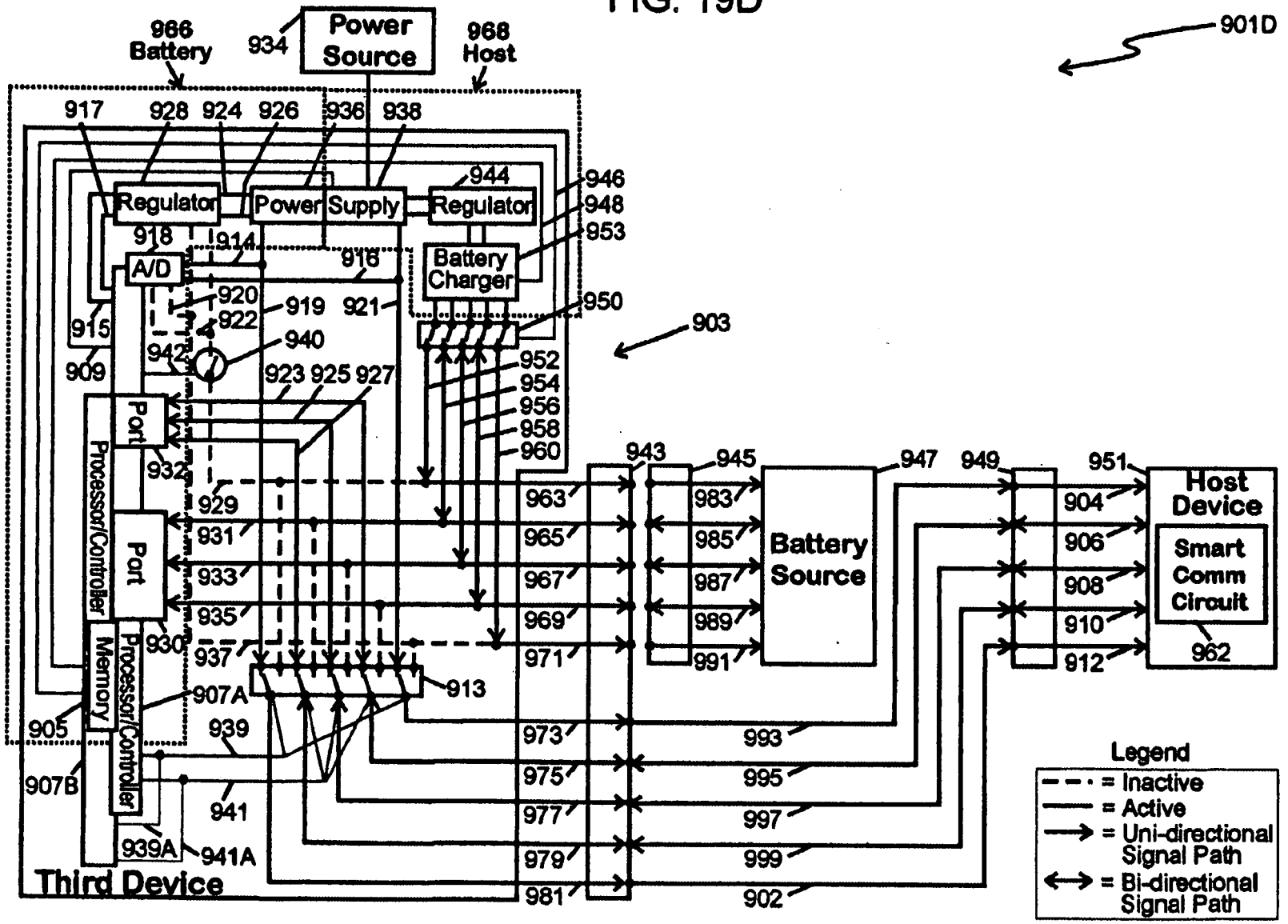

Power Source
934
915 917 928 924 926 936 938
Regulator
Power Supply
918
914
919 921
A/D
920
922
916
903
942
940
923 925 927
Port
932
909
Processor/Controller
929
931
933
935
937
913
Port
930
907
Memory
905
939
941
Third Device
943
945
963
965
967
969
971
973
975
977
979
981
983
985
987
989
991
Battery Source
947
949
993
995
997
999
902
951
904
906
908
910
912
Host Device
953
Battery Charger
957
959
961
External Power
2021
901C
Legend
= Inactive
= Active
= Uni-directional Signal Path
= Bi-directional Signal Path

FIG. 19D


901D
986 Battery
934
Power Source
968 Host
917
928
924
926
936
938
Regulator
Power Supply
Regulator
944
946
948
953
918
914
916
A/D
Battery Charger
920
919
921
950
915
922
903
940
942
909
923
925
927
952
954
956
958
960
Port
Processor/Controller
932
943
945
947
949
951
929
963
983
Host Device
931
965
985
Smart Comm Circuit
Port
933
967
987
Battery Source
935
969
989
930
937
971
991
962
907A
913
Memory
Processor/Controller
905
939
973
993
907B
941
975
995
939A
941A
977
997
979
999
Third Device
981
902
904
906
908
910
912
Legend
= Inactive
= Active
= Uni-directional Signal Path
= Bi-directional Signal Path